The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

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Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Soaps, Oils, and Fats

THIS week's issue of THE CHEMICAL AGE is devoted more particularly to the subject of soaps, oils, and fats. As already explained, in publishing these occasional special numbers it is not so much our object to break new ground in any particular subject as to put before those with the ordinary general knowledge of industrial chemistry (of whom the majority of our readers are composed) the basic facts connected with some staple branch of the industry.

So far as this week's contents are concerned it should be mentioned that we are dealing with the subject of oils as related to the soap and kindred industries, and not in the broader sense of the term which includes what is to-day the all-important but almost distinct study of mineral oils. As is well known, a large proportion of vegetable oils and some animal fats are liquid at ordinary temperatures; consequently, in that condition they are less valuable for the majority of purposes than are the solid fats. The history of the gradual evolution of oil-hardening—in the early days the use of nitrous or sulphuric acid was involved—needs no repetition here, but it is instructive to note that the present-day scientific procedure may be attributed almost solely to the genius of Sabatier, who, beyond the award of a Nobel prize, probably profited but little from his invention. As regards the effect of the extended adoption of the hydrogen process it is instructive to turn to the period just prior to the war, when the customary imports of raw material for soapmaking, &c. (*i.e.*, such products as tallow and palm oil), dropped suddenly by some 6,000 tons per annum. Speaking of the fact at the time a well-known manufacturer in this country remarked that the hardening process, in giving a great importance to substances such as whale and linseed oil which previously were of little account, had prevented an enhancement of the prices of basic materias and of soap itself, which would have considerably restricted both consumption and production. As a matter of fact, the war was followed by a very considerable increase in the cost of such commodities, but what this might have been had hydrogen hardening not existed one does not dare to conjecture. The application of the process, of course, is now by no means confined to soapmaking; and, perhaps, one of the most remarkable facts is the manner in which numerous varieties of inferior oils are purified and transformed into edible products. Again, the adaptability of the process is instanced by the announcement, made only a few days ago, that Lord Leverhulme has closed down for margarine making what was one of the first factories of its kind at Hyde in Cheshire, report having it that the plant will in the future be employed for soapmaking.

As to the possibility of effecting a reduction in the cost of soaps by eliminating an appreciable proportion of the fatty acids and supplementing them with clay in a colloidal condition our readers will already be familiar with the pioneer work of Mr. F. E. Weston, who contributed to our columns a noteable article on the subject in the early part of last year. At that time Mr. Weston was still engaged in his research, but undertook to reserve for THE CHEMICAL AGE the right of publication of any later facts which might be evolved from his work. The clay employed is "a reversible suspensoid," and it must be clearly emphasised that it by no means operates as a "filler." This was a point upon which considerable misunderstanding took place when Mr. Weston's original article was published, and the author was put to some trouble in contradicting the claims of those who had obviously confused the employment of fillers with a colloidal ingredient itself possessing marked properties of emulsification. It should, therefore, be understood that this particular clay produces an emulsion with oil and water, and the rate of saponification not only increases when it is added, but the action proceeds further under its

influence. In this week's issue Mr. Weston deals in general with the definite conclusions he has now arrived at. Next week he will deal with the more detailed results of his numerous experiments.

Chemical Engineering Group

THE second annual general meeting of the Chemical Engineering Group, to be held in London on Tuesday next, promises to be of considerable interest. The Group has found its place in chemical industry so quickly and has developed so rapidly in its activities that its achievements have rather outrun its organisation. This, however, is not a fault so much as an exaggeration of a merit, and the annual meeting will be a convenient occasion for reviewing the work of the past two years, and for deciding on the lines of future development. It is no secret that a suggestion is entertained in some quarters of making the Group a starting point for an Institute of Chemical Engineers. On this question we express no opinion. It is a matter to be considered carefully by the members themselves, and in any case a hasty decision is not to be advised. The Group, young organisation as it is, has settled some points, however, beyond dispute. It has great possibilities of development; it already includes in its membership minds of great resource as organisers, technologists and engineers; moreover, it has too great an abundance of youth and energy to suffer any suppression of originality and ambition. Whatever basis, therefore, it decides to work on, one condition is indispensable—it must have reasonable liberty to do its work in the way it considers best.

The number of members of the Group at the close of 1920 was 427, a quite satisfactory figure, and the expenses for the past year work out at £3. 6s. 3d. per member, not at all a big sum considering the range and excellence of the work undertaken. There is, as the honorary treasurer points out, no reason why a Group covering so large a field of industry should not be self-supporting, and the means recommended are the increase of subscriptions or the acquisition of new members or both. The annual meeting, which takes place at 7 p.m. in the Florence Restaurant, Rupert Street, will be followed at 8 by a dinner, at which Mr. J. Arthur Reavell will preside, and deliver an address on "The Future of Chemical Engineering." Mr. Mr. Reavell, Mr. F. H. Rogers, and Mr. H. Talbot have been re-elected respectively chairman, hon. treasurer and hon. secretary of the Group, and four new members of committee will be required to replace Messrs. E. A. Alliott, C. S. Garland, H. Griffiths and H. F. V. Little. We understand that Mr. Alliott, who presented an important paper on "Filtration" at the fourth conference of the Group in Newcastle-on-Tyne last year, has been approached by Mr. D. R. Sperry (U.S.A.) with a request for suggestions and assistance in preparing a symposium on "Filtration," arranged for the autumn meeting of the American Chemical Society, at which it is hoped a number of members of the Society of Chemical Industry will be present. The committee of the Group are anxious to assist in making this symposium as complete as possible, and any member who has suggestions or ideas is requested to communicate with Mr. Alliott at 41, Parliament Street, London, S.W. 1.

Industrial Poisons

THE welfare of the modern workman is now cared for with such precision that the danger of contracting disease or poisoning from his occupation is considerably minimised. An analysis of the annual reports made by the Chief Inspector of Factories shows that fatal cases are largely on the decrease, and it is a notable fact that causes, such as lead, phosphorus, arsenic, and mercurial poisoning, which at one time took a large toll, have been reduced to a figure so small as to make them almost negligible. During the abnormal period of the war some appreciable increase in fatalities was, of course, to be expected; but the thorough manner in which the regulations were observed was undoubtedly responsible for the comparatively small percentage of casualties in dangerous trades which has been recorded of late years. Apart from actual disease arising from the worker coming in contact with toxic substances, there is the larger question of the general health of individuals employed in various trades. Sir Kenneth Goadby, who is to lecture at the Royal Society of Arts on May 30, has for many years studied the general conditions under which labour is carried on, and is of the opinion that a large proportion of sickness can be prevented. He is understood to maintain that whereas some workers are particularly liable to poisoning, others are almost immune. By excluding the former class from employment in certain industries and employing the latter, combined with the observance of the rules in force for dangerous trades, it may be possible to effect drastic reductions in industrial sickness. The worker should also be tested for blood pressure. This is particularly necessary in the case of painters, who, as a body, are liable to over-pressure of blood as one of the effects of the turpentine which they employ in their trade.

Poisoning can be effected apparently in far more occupations and industries than the general public realise. Those engaged in the new peat industry, for instance, are liable to an irritation of the skin, which in some cases sets up cancer. Handlers of pitch and tar run a similar risk. Makers of felt hats are liable to poisoning from the mercury employed in their manufacture. In the confectionery trade the workers suffer from an irritation of the hands owing to dabbling in sugar. The fur industry victimises those engaged in it, owing to the poison employed in the preservation of the skins. During the war the shell workers who were employed on the capstan lathes suffered from eruptions caused by contact with the lubricating fluid used to cool the tools. These are only a few examples of the many ills to which industrial workers are exposed, as Sir Kenneth Goadby holds, to an unnecessary extent. We make, he says, selections of people who are mentally fitted for certain posts. An engine-driver is tested for colour-blindness before he is allowed to drive an engine. Why should not the industrial worker, in occupations liable to cause poisoning, be first tested to see if he belongs to the class who are peculiarly susceptible to poisons?

Reparation Recovery

THE agreement come to between this country and Germany as to the collection of the duty under the German Reparation Act is expected to come into force

early next month. When the arrangements have been completed between the German authorities and traders for carrying it out, then, in the case of goods coming direct into this country from Germany, the importer will pay 26 per cent. to the Customs and the remaining 74 per cent. to the German exporter. Where German goods come through neutral countries, they will not be taxed by the British Customs, as the German Government will collect the tax before the goods leave Germany. On the face of these arrangements the tax will come entirely out of Germany. Apparently the German exporter who is paid 74 per cent. by his British customer will get the remaining 26 per cent. from the German Exchequer, which in turn will have to extract it from the general body of German taxpayers. It is thought that since the German Government undertake to recoup the German exporter the amount deducted by the British Customs there will be no inducement to raise the price as was originally suggested. We see nothing, however, to prevent this being done, and it is natural to suppose that if the German trader can indirectly transfer the whole or part of the tax on to the British purchaser he will not hesitate to do so. Experience will presently show whether the price of German goods is being deliberately put up.

This arrangement appears to dispose of the suggestion that British purchasers would pay the full invoice price to German exporters and pay the whole duty themselves. In the event, however, of this practice being still followed, the British Customs authorities have already given a ruling which makes the position of the importer fairly clear. If the latter pays more than the 74 per cent., any excess will be taxed in the proportion of 26 to 74 per cent. If, for example, the invoice price is £100, and the importer, instead of merely paying £74, pays the full value to the German trader, then the tax due from him, instead of being £26, will be about £35. It may be taken generally, therefore, that whatever amount is actually paid direct to Germany will be treated as only 74 per cent. of the value and the balance must be paid direct to H.M. Customs.

A point has been raised as to why the German Government should not collect the tax on goods coming direct from Germany as they will do on goods coming through neutral countries, and pay it over to the British Customs. We understand that the British Government attach importance to the collection of the percentage due direct from the British purchaser, and to the payment of the 26 per cent. in pounds sterling. This establishes the primary title of the British Government to the amount of the tax without its passage through Germans hands, and disposes of any possible difference about rates of exchange.

Trade Disputes

WE heard a chemical merchant commenting rather bitterly recently on the large number of trade disputes now going on, and the extent to which arbitration is being resorted to and is becoming quite a remunerative profession for those who specialise in it. His theory was that it marked a decline from the traditional standards of the British trader, and showed a corresponding increase in the gambling or speculative class of trade. The tendency is certainly not a good one. The trader who carries on his business from one generation to another has a personal and commercial reputation in which he takes some pride, and in addition his customers are a continuing constituency with which he hopes to be dealing ten years hence as he was ten years ago. Firms in this responsible position cannot afford to repudiate obligations honourably entered into on mere technical points. Their dealings are subject to a standard of honour as well as to legal judgments or awards, with the result that business is kept on a high and responsible plane.

With the gambling type of business man it is different. He speculates in contracts much as he does in stocks and shares, trading largely in mere margins. When he finds himself with stocks too heavy for his financial carrying capacity, or when a sudden variation in prices converts a prospective gain into a positive loss, the temptation is to try to get out of it if a passable pretext can be found. It is not quite as bad as actually pleading the Gaming Act, but the principle is much the same, and we are told that trade disputes of this class have of late become unpleasantly common. Bona fide differences there must be from time to time, to be settled by reference to independent judges. These, however, are not the class of disputes we have in mind. What is lamented by many people in business is the uprise of a new class, who are willing to take advantage of slips in agreements in order to escape losses on transactions which have not turned out well. The spread of such a spirit is not good for trade, for it means that terms and conditions have to be more strictly scrutinised and defined, and it results in a loss of the mutual trust and confidence so essential to sound commerce.

The Calendar

May 30	Royal Society of Arts: "Industrial Disease and Immunity," by Sir Kenneth Goadby. 8 p.m.	John Street, Adelphi, London.
30	National Union of Scientific Workers: Public Meeting: "The Administration of Scientific Work." 8 p.m.	Botanical Theatre, University College, Gower Street, London.
31	Faraday Society: General discussion on "Physico-Chemical Problems Relating to the Soil." Sir A. Daniel Hall will preside.	Burlington House, Piccadilly, London.
31	Chemical Engineering Group: Annual General Meeting 7 p.m. Dinner 8 p.m.	Florence Restaurant, Rupert Street, London.
June 1	Society of Public Analysts: Papers by F. F. Beach, T. E. Meade, E. Russell, N. Evers, and F. R. Dodd. 8 p.m.	Rooms of Chemical Society, Burlington House, Piccadilly, London.
2	Chemical Society: Ordinary Scientific Meeting	Burlington House, Piccadilly, London.

Book Received

FAMOUS CHEMISTS, THE MEN AND THEIR WORK. By Sir William A. Tilden, F.R.S. London: George Routledge & Sons, Ltd. New York: E. P. Dutton & Co., Pp. 296. 12s. 6d. net.

Colloidal Clay and the Hydrolysis of Oils and Fats—(I)

By Frank E. Weston, B.Sc., F.I.C.

Readers of THE CHEMICAL AGE *will remember that about fifteen months ago Mr. F. E. Weston contributed a noteworthy article on the use of colloidal clay in soap manufacture. At that time his article was considered of such importance that it was widely quoted in both the daily and technical press. For the past twelve months Mr. Weston has been assiduously continuing his research, and we were able to make arrangements with him for priority of publication of his results. Below he describes his experiments in connexion with the use of colloidal clay as an aid to the hydrolysis of oils and fats. The detailed results of his work will be given in the concluding portion of his article which will appear next week.*

Introduction

THE hydrolysis of the fixed oils and fats, as carried out on a technical scale, is more or less incomplete even under the best conditions known. The products required, namely glycerol and fatty acids or soap, are always more or less contaminated with other products formed during the reaction and the time required for the hydrolysis is usually lengthy; hence, any modifications of existing processes that tend to increase the amount of hydrolysis or to shorten the time of the reaction are greatly to be desired.

Before entering into detail as to the effect of colloidal clay on the process of hydrolysis of oils and fats it is advisable to summarise the various methods employed and to indicate briefly their shortcomings. The methods which have been or are technically employed for hydrolysing oils and fats include the following.

I. Water alone.
  1. As high pressure steam.
  2. As superheated steam at a lower pressure.

II. Water in the presence of a catalyst.
  1. Acids (*a*) Mineral: Hydrochloric or Sulphuric.
     (*b*) Aromatic Sulphonic: Twitchell's reagent.
  2. Bases. (*a*) Oxides: Calcium, Magnesium or Zinc.
     (*b*) Hydroxides: Sodium or Potassium.
  3. Ferments. (*a*) Vegetable: Castor Seed.
     (*b*) Animal: Pancreatic.

Various Hydrolyzing Processes

I. WATER ALONE.

This is usually accomplished by heating the oil or fat with water under a pressure of 15 atmospheres, *i.e.*, equivalent to a temperature of 200° C. or by heating the oil or fat with superheated steam at a pressure of from 8 to 10 atmospheres.

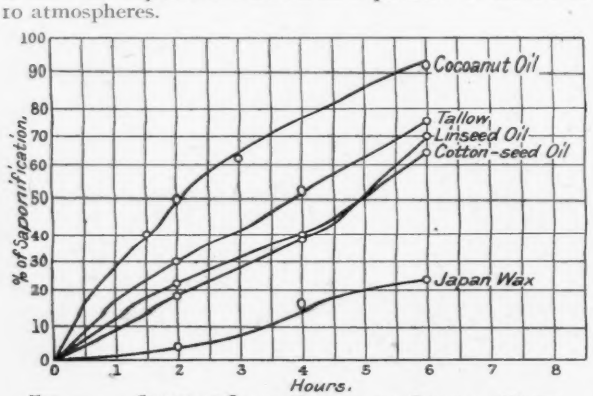


FIG. 1.—30 GRAMS OF OIL OR FAT AND 500 GRAMS OF WATER HEATED AT 15 ATMOSPHERES.

The hydrolysis, however, is never complete and the products are always discoloured. The method has been investigated by Klimont and the curves in Fig. 1, drawn from Klimont's data, illustrate the course of the reaction.

II. WATER IN THE PRESENCE OF A CATALYST.

1. *Hydrochloric Acid.*—The action of this acid on hydrolysis has been studied by Lewkowitsch and the following table is illustrative of the results obtained:

100 grams of Oil or Fat boiled with 100 c.c. of HCl of s.g. 1.16.

Oil or Fat.	*Per cent. of Hydrolysis after 24 hours.*
Cotton Seed.	71·2
Whale	80·6
Rape Seed	70·4
Lard	70·1
Tallow	73·5
Cocoanut	76·8
Castor	25·3

On increasing the time of hydrolysis and adding more hydrochloric acid after withdrawing small test samples at stated intervals, Lewkowitsch found that hydrolysis becomes very much slower after 75 per cent. of the neutral oil or fat has been hydrolysed. He explains this by stating that "*under the conditions of the experiment it was difficult to keep up a thorough intermixture of fat and acidulated water.*" He further stated that "*It may be safely assumed that, provided a thorough intermixture, as an emulsion, could be brought about, hydrolysis would proceed more rapidly.*"

It is extremely important to note that intimate mixture of the reacting bodies is required and that this should be of the nature of an EMULSION.

2. *Sulphuric Acid.*—This acid has been found to give much better results than hydrochloric acid and appears to act to some extent as an emulsifying agent in the technical process of hydrolysis, in which concentrated sulphuric acid is used, viz., the autoclave process. Lewkowitsch states that in the case of the saturated glycerides it acts solely as a catalyst, whilst in the case of olein the first action would consist in the formation of sulpho-compounds of glycerides the composition of which have been investigated by Geitel. At higher temperatures these sulpho-compounds are decomposed rapidly, into other compounds forming a complete *emulsion* with fats and water, so that on agitating the emulsion with steam, complete hydrolysis to glycerol and fatty acids is *gradually* brought about.

It should be noted, however, that even in this case complete hydrolysis is difficult to obtain since the rate of hydrolysis falls off considerably as the reaction proceeds; this is clearly shown in the curve given in Fig. 2. This curve is drawn from the results obtained by Lewkowitsch with tallow.*

In actual practice the yields of fatty acids vary from 87 to 94 per cent. of the theoretical; in this case also the products are always highly discoloured, due to the formation of other compounds.

*(See page 84, *Chem. Tech. and Analy. of Oils, Fats and Waxes*, 5th Edition. Lewkowitsch.)

3. *Sulpho-aromatic Acids.*—The commonest acid used is that known as Twitchell's reagent, which is stated by Twitchell to be C_6H_4 (SO_3H) $C_{18}H_{35}O_2$ in the case of benzene and C_6H_3OH (SO_3H) $C_{18}H_{35}O$ for phenol.

When this reagent is used to the extent of 1 to 2.5 per cent. of the weight of oil or fat being hydrolysed, it is stated to produce a more pronounced *emulsifying* action then sulphuric acid and hence a better hydrolysis; however, technically the reaction is never complete; its great advantage over sulphuric acid is that the reaction is carried out under ordinary pressure and at lower temperature. Lewkowitsch regards the action of the Twitchell reagent as purely catalytic and of the same order as ferments.

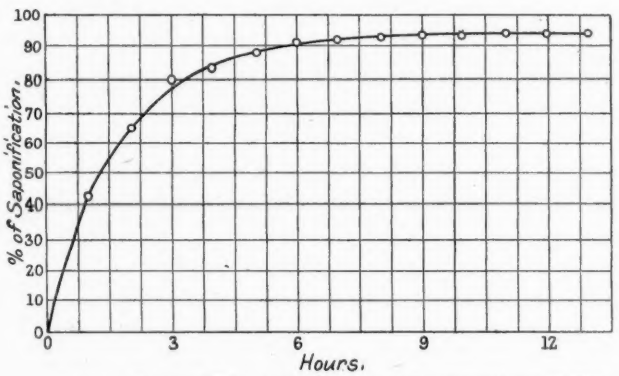


FIG. 2.—TALLOW HYDROLYSED WITH 4% CONCENTRATED H_2SO_4 AT 120°C.

Moreover he makes the following striking comment *re* the process:—"*Such phenomena as these seem to show the extremely important influence which complete emulsion with water has on the progress of hydrolysis.*"

Basic Compounds

(*a*) *Metallic Oxides.*—It has been found that certain metallic oxides have a marked catalytic influence on the hydrolysis of oils and fats; this, however, occurs only when the oils and fats are heated with water under pressure in the presence of these oxides. In open vessels it is found that in order to effect complete hydrolysis an excess of the basic oxide over that required to neutralise the acids produced by complete hydrolysis is required. Technically, the autoclave process which is used, never effects complete hydrolysis, 90-95 per cent. of the theoretical being an average yield. The products, though discoloured, are purer than in the case of the sulphuric acid.

(*b*) *Hydroxides: Caustic Soda and Caustic Potash.*—These compounds greatly accelerate the rate of hydrolysis, even at ordinary atmospheric pressure, and hence hydrolysis by these catalysts is always carried out in open vessels. The acceleration is probably due to two causes. Firstly, the fatty acids produced by the hydrolysis are neutralised by the alkalies forming soaps, and hence any reverse action of the fatty acids with glycerol is obviated, and secondly the soap produced tends to form an emulsion with the oil and water, thus producing a more intimate mixture.

Complete hydrolysis, however, is never attained unless an excess of the base, over that required to neutralise the acids produced by complete hydrolysis, is used.

The great drawback to the method is the length of time required for completion of the hydrolysis, and the fact that the resulting soap contains excess of alkali which requires removing in order to obtain an alkali free soap.

Ferments.—Many ferments have been obtained from vegetable seeds which have more or less catalytic effects on the hydrolysis of oils and fats. The most important is the ferment contained in the castor-seed, which has been applied technically to the hydrolysis of oils and fats. The action of this ferment has been fully investigated by Niclonx. The results, however, do not indicate a complete hydrolysis.

Conclusions

The conclusions arrived at from a study of the various methods used technically for the hydrolysis of oils and fats may be summarised as follows:—

1. In order to effect complete hydrolysis:—

   (*a*) High temperatures have to be used which always produce decomposition of the products of hydrolysis with consequent loss of glycerine and fatty acids.

   (*b*) Excess of the catalysing agent must be used, especially in the case of "saponification" by alkalies with consequent alkalinity of the soap produced, thus needing further operations to produce a neutral soap.

   (*c*) An excessive length of time is required for complete hydrolysis.

2. Hydrolysis is effected more rapidly and completely provided intimate contact can be brought about between the oil or fat, water and catalyst, that is provided a *complete emulsion* of these bodies can be obtained, consequently any substance that can effect perfect emulsion ought to increase the velocity of hydrolysis and attain a more complete hydrolysis.

Emulsifying Power of Colloidal Clay

In a previous article (THE CHEMICAL AGE, January, 1920) it has been shown that it is possible to incorporate colloidal clay with soap, forming a perfectly homogeneous mixture, which dissolves in water to give a colloidal solution from which the colloidal clay does not separate on standing. In the course of the work entailed in that investigation it was discovered that colloidal clay possessed marked emulsifying powers on mixtures of oil and water, irrespective of the oil being of a mineral, vegetable or animal origin. This property has been under examination during the past year with interesting results, which will be described later.

Effect of Colloidal Clay

Since it has been recognised that one of the factors in the hydrolysis of oils and fats is the formation of an emulsion of the reacting bodies it was thought that the addition of a small quantity of colloidal clay to the oil undergoing hydrolysis would greatly assist the process not only because the clay produces an emulsion with oil and water, but also because of the better emulsion formed in the presence of soap solution. Preliminary experiments very clearly indicated that the rate of saponification is greatly increased in the presence of colloidal clay, and that saponification proceeds further under the influence of colloidal clay than without it.

The clay used in the following experiments is of such a finely divided nature, that by the aid of a small amount of sodium carbonate it can be dispersed in water to form a colloidal solution; this solution can be readily flocculated by certain electrolytes and the precipitated clay can be brought again into solution under suitable conditions; hence the clay belongs to the class of reversible suspensoids. The results of the experiments will be dealt with in the concluding portion of this article.

OIL FUEL is being adopted by an increasing number of industrial undertakings of varied character in South Wales. One of the latest to instal an oil-burning apparatus is a well-known Cardiff firm of brewers, who report that the experiment is a complete success. It is also stated that successful experiments have been made in tinplate works in the heating of tinning pots by oil fuel instead of coal.

Some Notes on a New Fuel Oil

Successful Tests with Palm Oil

In an editorial article, a few weeks ago, we drew attention to the use of palm oil as a fuel. In the following article the writer amplifies the information previously given, and adds some interesting facts in connection with the cultivation of the oilpalm and the uses to which it is put.

THE world's supplies of fuel at present consist almost entirely of coal and petroleum, both of which are minerals, and therefore limited in quantity, but, although limited, they have been consumed with such prodigality that they are now within measurable distance of exhaustion, and one of the greatest problems of the day is to discover a new source of fuel for power. Two sources of supply have so far merited serious consideration and they have the very great advantage of being, so to speak, perennial and unlimited, that is to say, water-power (or white coal) and ethyl alcohol. The former will last as long as there is any rainfall or until this planet of ours dries up, and the latter—alcohol—is produced from vegetable matter which can be grown or renewed every year. But water-power is not to be found everywhere, although it must prove an extremely valuable asset in countries where it abounds, and it involves heavy expenditure for plant and lay-out. In regard to alcohol, it has not been found easy to produce it cheaply in large quantities, and hitherto it has involved the use of valuable food products in its manufacture; except in the case of molasses, sawdust and some other materials.

A third very important source of fuel has now been tested, also of vegetable origin, and that is palm oil, the product of the oil palm (*Elaeis guineensis*) of West Africa. The tests with this oil were first begun in 1914 and resumed after the war by a Belgian company, the Omnium Africain, which has since amalgamated with another Belgian company, the Belgoleum, and changed its name to La Compagnie Generale du Congo. It has a total capital of 20,000,000 francs, and its chairman is M. Renkin, late Belgian Colonial Minister. A large English firm is also interested in the same problem and has carried out some tests in the Congo, which have proved very satisfactory so far. Both companies are very largely interested in the oil palm industry and the production of palm oil and palm kernels—from which latter palm kernel oil is obtained—and naturally they were not slow to realise the great economic importance of being able to use palm oil, especially low grade unrefined palm oil, as an engine fuel. The matter is of particular importance in the Congo and other parts of the tropics where fuel both for industrial purposes and for river navigation is extremely costly. The tropics generally are poorly supplied with mineral fuel, and experiments with sun-power have not been very promising up to the present, so that if a vegetable oil like palm oil can be utilised for fuel purposes it will constitute an epoch-making development in tropical industries. And it is important to note that the oil palm is being introduced into other countries beside West Africa, notably in Malaysia, the East Indies and South America, also in Ceylon. Some details of these extensions of the oil palm industry will be given later.

Experiments in Belgium

The Belgian tests referred to above were carried out in Brussels with a Swedish engine, the Drott, a two-cycle semi-Diesel engine of 8-10 h.p. at 500 revs. per min. This engine is of simple design and very robustly constructed, and the only special feature required in order to adapt it for palm oil was a particular form of feed tank for keeping the oil in a perfectly liquid condition. As normal palm oil has a melting point of 37°C. it is of a viscous or semi-solid consistency at ordinary temperatures, and therefore for use in an engine it must be kept heated and liquefied. It was found that low grade palm oil, unrefined, and containing a high percentage of free fatty acids could be used quite satisfactorily; the fatty acids were almost completely burnt and there was no corrosion. This is very important, for the refining of palm oil is a troublesome and costly business, and if these low grade oils can be used for fuel this new use for the oil will not encroach on other important uses, such as the edible fat (margarine, &c.) industry. Its most serious competitor will be the soap industry, but with this it will probably be able to hold its own. To keep the oil liquid, the feed tank consisting of a series of compartments separated by a fine mesh metallic screening, is heated by the cooling water of the cylinder, this water being heated up to about 70°C. The hot exhaust gases also help to heat the oil and evaporate any moisture present therein, and complete liquefaction is further ensured by placing a small petrol vapour lamp under the tank. The object of dividing the feed tank into compartments by means of fine screening is thoroughly to filter the oil, although one would have thought it easier to filter the oil before use. A rather unusual feature, and one which does not find much favour with present-day designers of internal combustion engines, is the injection of a certain amount of water into the combustion chamber, the object of which—it is alleged—is to ensure complete vaporisation of the oil and a thorough mixing of the oil mist with air. The products of combustion are thus said to be absorbed by the water vapour or steam and also by the burnt gases and escape through the exhaust. It is claimed that complete combustion is thus obtained, also the avoidance of any risk of premature combustion, with consequent maximum economy of fuel. The engine is fitted with a specially sensitive centrifugal regulator for apportioning the amount of oil fed into the engine load, and this regulator also controls the amount of water injected into the cylinder, so that such injection can be in no way objectionable, but is, on the contrary, very advantageous. At all events, the makers of the Drott engine, during their 20 years' experience, have designed engines with water injection and also without water injection, and they have decided in favour of the former, although, as already stated, this is contrary to general practice both in this country and in America. In fact, the U.S.A. Bureau of Standards, in a recent report, pronounced very decidedly against water injection. This does not, however, affect the main problem as to the suitability of palm oil as a fuel, for the question arises whatever fuel is used. Up to the present it has been found necessary to start the engine with petrol and to finish the run with petrol so that no palm oil is left in any part of the engine while it is at rest, as this residual oil would congeal and clog the engine parts. A small petrol tank is therefore provided alongside the palm-oil tank. The tests so far are said to have been very satisfactory, and are being continued.

Beside palm oil other vegetable oils have occasionally been tried, but with little success. About 20 years ago, according to the French engineer, M. Mathot, attempts were made to run an Otto engine—one of the earliest internal-combustion engines—with castor oil, but this oil caused a considerable amount of corrosion, with formation of acetic acid. Peanut oil, also known as groundnut or

arachis oil, has also been tried as an engine fuel, likewise with little result; and it is, moreover, rather too expensive an oil to be used for this purpose, for it is one of our most valuable edible oils.

The Palm Oil Trade

The oil palm of West Africa is a most valuable tree and equals, if it does not exceed, the coco-nut palm in economic importance. These two—the oil palm and the coco-nut palm—reign supreme as the chief sources of wealth in the luxuriant tropics. To the West African native the oil palm yields food, drink and shelter. He obtains oil from the fruit, wine from the stem, and builds his huts of palm leaves. For the hungry nations of Europe during the great war, and since, the oil palm and the coco-nut palm supplied a great part of the deficiency of edible fats, particularly the raw material for the manufacture of margarine. The trade in palm oil and palm kernels which was chiefly monopolised by Hamburg and Bremen before the war has now been diverted to British ports, Liverpool and Hull, and a very large and important industry in vegetable oils has been built up in this country. Palm oil must be distinguished from palm kernel oil: the former is obtained from the fleshy pericarp of the palm fruit, whilst palm kernel oil is obtained from the kernel of the palm nut, which, in turn, is contained by the outer pericarp. The fruit grows in large clusters or cones, varying in size and number according to the skill and care bestowed on the cultivation of the palm. Palm oil is chiefly produced in West Africa, and is now exported to the extent of nearly 150,000 tons per annum. Palm kernel oil is mainly produced in Europe—Great Britain and France—from the kernels exported from West Africa. The exports of these kernels from West Africa now amount to about 400,000 tons per annum, the greater part coming from Nigeria, with large amounts also from Sierra Leone and Dahomey; and as the kernels contain about 50 per cent. oil, this represents about 200,000 tons of palm kernel oil. The crushing of this enormous quantity of kernels and the extraction and refining of the oil, not only constitute a great and growing industry, but also form the basis of a flourishing margarine industry, the present output of which is about 7,000 tons per week. It remains to be seen whether cheaper butter will have much effect on this new industry: expert opinion is divided on the subject. Beside oil there is also obtained from the palm kernels a valuable cattle food in the form of palm-kernel cake, which is now finding increasing favour with the farmers and stock-breeders, especially as it is cheaper than other oil-cakes. Further, a large amount of elaborate machinery is required, not only in the large oil-mills in this country, but also in West Africa, for dealing with the palm fruit and manufacturing the palm oil. The supreme economic importance of the oil palm will thus be realised. The reason why the palm oil is made in West Africa, on the spot, is that the best quality oil is only obtained from perfectly fresh fruit; and if the whole fruit were exported to Europe the oil would suffer in quality and there would also be unnecessary freight on the shells of the palm nut. By extracting the palm oil in West Africa and exporting the kernels, the best quality oil is obtained and there is a great saving in freight.

There are several large firms engaged in this industry, foremost among which is the Huileries du Congo Belge, controlled by Lever Brothers, who have obtained vast concessions of oil-palm forests in the Belgian Congo. They have erected large factories, built towns, constructed roads and railways, organised fleets of river steamers on the Congo, established schools, medical clinics, &c., for the natives, and transformed large areas of the Belgian Congo from wild, impenetrable forest and jungle into up-to-date industrial centres.

The oil palm is being introduced into other countries outside Africa, now that its valuable products are better appreciated, notably in the East Indies (Sumatra) and the Malay Peninsula, also in South America and Ceylon. The Dutch have been very successful in their attempts to establish the palm in the East Indies, and here, again, private enterprise by a large firm of Dutch margarine manufacturers is largely responsible for the progress made.

The Late Mr. W. J. Leitch

(FROM A CORRESPONDENT)

THE recent death of Mr. John W. Leitch, of Milnsbridge, has deprived the chemical industry of this country of one of its best known and most beloved figures. Mr. Leitch studied at the Royal College of Science, South Kensington, and graduated B.Sc. at Glasgow University. He then took a post as secretary and chief chemist to a firm of chemical manufacturers at Milnsbridge. It was not long, however, before he began business on his own account, and ultimately he established the firm of John W. Leitch & Co. at Milnsbridge.

For many years Mr. Leitch had specialised in the manufacture of coal tar intermediates and certain dyes, and when the war broke out had he chosen to neglect the call of his country, he could have occupied an important position amongst the dye manufacturers of the world.

Amongst the products, however, which he had long been producing in considerable quantities was TNT, a great deal of which was used in America in connexion with mining. It is believed that he was the pioneer in this country in the manufacture of this substance, and that his efforts to bring it to official recognition had long proved unavailing. When the war broke out, however, Mr. Leitch was at once called upon to supply the War Office with this explosive, and at one critical period in the early days of the war the TNT produced at Milnsbridge played an important part in staving off disaster. Within 48 hours of leaving Milnsbridge it was fired at the enemy. In due course other manufacturers began to make TNT, and Government plants were erected for this purpose. The knowledge possessed by Mr. Leitch was placed at the disposal of the authorities. At the same time his own plant was extended to its utmost capacity.

Mr. Leitch had long recognised the importance of an efficient plant for the recovery of nitric acid and the reconcentration of sulphuric acid from the waste acids obtained in the manufacture of nitro bodies. For some years prior to the war he spent much time and energy in developing an improved cascade plant for concentrating sulphuric acid, which he patented. The efficiencies obtained in the completed plant were remarkable, and, indeed, such a concentration of acid was produced that TNT could easily be made without the aid of oleum. A large cascade plant of this description was put down under his supervision at a Government factory in Manchester.

The heavy work which Mr. Leitch did in the early years of the war so told upon his health that towards the end of 1916 he had a breakdown following an attack of influenza, which left his heart seriously affected. He recovered sufficiently, however, to resume his activities, and in 1919 was appointed chairman of a mission sent by the Board of Trade to study some of the dye works in the occupied area of the Rhine. The two-volume report of that mission is an eloquent testimony to the work done by all the members under his chairmanship. He also took part in the formation of the firm of Lankshear, Wickstead & Company, Limited, of which company he was chairman from its inception.

Mr. Leitch was a member of various public bodies, upon which he did much useful work with a characteristic unobtrusiveness. He was widely known throughout the United States as well as in this country, and his loss will be deeply felt by many well-known members of the chemical industry who enjoyed his friendship.

In order to assist and encourage manufacturing operations where benzene is employed extensively, the Italian Government has arranged a specially REDUCED TARIFF ON BENZENE and other light coal-tar oils for use as raw materials in the production of synthetic organic colouring matters or varnishes and similar products.

The Industrial Uses of Coco-nut and Allied Oils

By a Soapworks Chemist

Coco-nut oil, and certain other oils of a like character, differ chemically from all other vegetable oils in containing a large proportion of glycerides of lower fatty acids. Unlike the fatty acids of high molecular weight, which compose the great majority of oils and fats, the lower acids are more or less volatile in steam and soluble in water, and it is to the presence of these fatty acids—known to chemists as caproic, caprylic, capric and lauric acids—that the special properties of coco-nut and allied oils are due.

It is a curious fact that the oil obtained from the kernels of the oil palm (elæis) is almost identical, both in its chemical composition and properties, with coco-nut oil, and can be used in place of the latter in most, if not all, of its industrial applications. The only chemical difference between the two oils is that coco-nut oil contains rather more of the glycerides of the water soluble fatty acids than does palm kernel. If coco-nut oil is pressed, these glycerides are largely removed and the resulting substance, known as coco-nut stearine, is practically identical, chemically and physically, with palm kernel oil and cannot, indeed, be distinguished from the latter, even by the most searching analysis.

Other and less known oils, which are similar to coco-nut and palm kernel, are cohune oil, from the kernels of the cohune palm, a native of British Honduras, muriti fat and mocaya oil, from two varieties of South American palm, and maripi fat, from a palm growing in the West Indies.

The oil known by the name of tangkallak fat, obtained from the fruits of a variety of *Cylicodaphne*, which is a tree very common in Indo-China, also has very similar properties to the previously mentioned oils.

Of these lesser known oils, one or two have already been available in fairly large quantities, especially cohune oil, and in the future it is likely that much larger quantities will be available. All these oils, therefore, on account of their chemical composition, possess distinctive properties which render them available in several important industries.

Soap Manufacture

In soap manufacture they have for many years been employed, on account of the **free lathering properties** which they confer upon all soaps in which they are used. Originally hard soap was manufactured very largely from tallow, which produced a soap which was soluble with difficulty in cold water, and consequently very slow in use for ordinary purposes. With the introduction of the "washer" class of soaps, consisting largely of coco-nut oil, a quick lathering article was obtained and ever since its first introduction coco-nut oil has entered very largely into the composition of such soaps. For the same reason it is also very largely employed as a constituent of milled and toilet soaps, although in this case it is found that if a high percentage be employed, the soap is apt to develop a rank odour.

Another special property of the coco-nut class of oils is their capacity for **absorbing a large percentage of water** without the resulting soap losing its property of setting fairly hard. Thus, soda soaps made from coco-nut oil, can be produced in bar form with as low a fatty acid content as 20-25 per cent., providing that carbonates, chlorides and other filling materials are employed to give the necessary rigidity to the finished soap.

A further important property of coco-nut and palm kernel oils is that owing to their high content of soluble fatty acids, the soap made from such oils can be **used with salt water** and the so-called "marine" soaps, for use with sea-water, are manufactured largely from these oils.

Coco-nut oil also enters very largely into the composition of **liquid soaps** for perfumery purposes, not only on account of the prejudice in favour of coco-nut oil as a hair restorative, but also on account of the fact that a potash soap made from the oil will remain clearer and more liquid at a given strength than any other known oil.

Coco-nut and palm kernel oils have been very largely employed in the manufacture of so-called **"cold process"** soaps. The function of the coco-nut oil in such soaps is to commence a chemical action between the oils and the caustic soda, which, when once started, results in complete saponification without the necessity of boiling together the constituents. The presence of coco-nut oil is essential, because it is the only oil which is able to react with relatively strong solutions of alkali. In recent years the manufacture of soap on the cold process has considerably declined, owing to the fact that it is difficult with soaps made by this method to control the exact percentage of free or uncombined alkali remaining in the finished product and for most purposes an excess of free alkali is very undesirable and even injurious.

In addition to the foregoing uses, coco-nut oil is employed in the manufacture of soaps intended for cleaning **coloured articles** (e.g., "carpet soaps"), since it is possible to incorporate a large proportion of common salt with soaps made from this oil, which prevents the running or dissolving of the colours in such fabrics.

Edible Products

Coco-nut oil has long been used in various edible products, both alone and in combination with other oils in margarine.

Chemically, it approximates much more closely to butter fat than any other known oil, and is on this account probably more easily digested than other vegetable or animal fats. It is used alone under a large number of trade names as a **cooking fat,** and such oil should be practically free from taste or odour, or possess only a very slight nutty smell and mild, bland flavour, with no suspicion of sharpness. Whilst in the case of oils intended for soap manufacture the percentage of free fatty acids is, to a large extent, unimportant, for edible purposes the oils should be practically neutral and to attain this end they are refined by treatment with an alkali, which combines with any free fatty acids present in the oil and precipitates these in the form of soap.

As a constituent of **margarine,** coco-nut oil has much to recommend it and has been used in enormous quantities, even to the exclusion of other oils. The melting point approximates to that of butter fat and the oil can now be obtained practically free from any characteristic coco-nut odour. Although not so suitable as coco-nut oil, palm kernel oil was used in very large quantities in the manufacture of margarine in place of the former during the war period. A disadvantage connected with the use of this oil in margarine is its liability to a certain peculiar and most objectionable form of rancidity. In the case of margarine prepared from oleo, in combination with other oils and fats, rancidity results in the production of a sour or putrid odour, but when coco-nut or palm kernel oils are present to any considerable extent, the margarine on becoming rancid develops a most characteristic, sweetish, pungent odour and an extremely offensive flavour. This is undoubtedly due to the action of moulds and other micro-organisms on the coco-nut oil, resulting in the decomposition of the lower fatty acids, which, as previously mentioned, are peculiar to coco-nut and palm kernel oils.

Recent Developments in Soft Soap Manufacture

By Percival J. Fryer, F.I.C.

Mr. Fryer discusses the manufacture and properties of common soft soap, and shows how, during the war, the soft soap industry was threatened with extinction owing to the inability to obtain German potash.

SOFT soap, which is another name for potash soap, has long been used on account of its very excellent detergent properties for general cleaning and scouring operations. For such purposes it is undoubtedly superior to hard or soda soaps, and it is a little unfortunate that many people appear to have a prejudice against its use, as compared with hard soap or soap powders, which are unquestionably less efficient.

Old traditions die hard, and much of the modern prejudice against the use of soft soap is undoubtedly due to a somewhat vague recollection of the kind of soft soap which was common many years ago, and which can only be described as objectionable and even offensive in nearly every respect. These old-time soft soaps were manufactured from the crudest of fish and marine oils, and in addition to the foul odour produced by the use of such materials, were apt to contain a large percentage of free or uncombined alkali, which had a most injurious action on the skin. They were commonly very dark or even black in colour, as witness the name "Black Soap" which still subsists in Scotland and the North of England, as a synonym for soft soap. Even in this unattractive form soft soap was very largely employed by those who knew and appreciated its valuable detergent properties, but its crude character and its unpleasantness in use undoubtedly combined gradually to render it unpopular, especially in the South of England.

It needs to be emphasised that the best grades of soft soap, as produced to-day, compare favourably in appearance and character with hard soap or soap powders, and are unquestionably more efficient for a great variety of purposes. Having regard to the relative price, as compared with efficiency in detergent properties of soft and hard soaps, the former is undoubtedly the cheaper in use. Where soap is used on a large scale, as in public institutions hospitals, &c., soft soap has the preference in the great majority of cases. In the household, however, owing to the unfortunate tradition previously mentioned, soft soap is not used to-day to anything like the extent that its merits deserve.

As manufactured at the present time, soft soap intended for household purposes is of an attractive light yellow colour (not unlike marmalade in appearance), and should be practically odourless or possess only a faint and not unpleasant smell.

It is commonly manufactured from a good grade of refined vegetable oil, such as linseed or preferably soya bean oil, and the percentage of free or uncombined alkali is carefully controlled, so as to render it unobjectionable in its action on the skin. For scrubbing floors and similar purposes, when added to hot water, in which it readily dissolves, a small quantity suffices to make a bucketful of diluted soap.

As a washer for clothes it is very efficient, and for this purpose is best dissolved in about double or treble the quantity of boiling water, forming a concentrated liquid of which a suitable amount is added to each tub or washer-full.

For the cleansing of plates and dishes, soft soap is eminently suitable and the method used in large hotels is undoubtedly the best. This consists in adding a small quantity of the soap to a vessel of hot water, and completely immersing the articles in this, subsequently rinsing with cold water and placing in a rack to drain.

In many industries soft soap is very largely employed for scouring purposes, the best known example of this being in the preliminary treatment of raw wool. This industry is chiefly carried on in Yorkshire, and many hundred tons of soap are annually employed in the scouring of raw wool, as a necessary preliminary treatment to the production of yarn.

The use of soft soap in the spraying of fruit trees and hops, for the destruction of insect pests, is well known, and it has been found from long experience that potash soap is not only more efficient for this purpose, but has considerably less action on the leaves of the plant than in the case of soda or hard soaps.

Potash soaps are often combined with disinfectants in liquid form, and such compounds are very largely used in hospitals and for general hygienic purposes.

During the period of the war, when German potash was practically unobtainable and supplies from other countries very meagre, the soft soap industry was threatened with virtual extinction. It was then found that by the use of suitable oils (of which castor oil was the most important) it was possible to make a soda soft soap substitute, which conformed very closely in appearance and general character with genuine potash soft soap. This soda substitute was very largely employed, but it was essentially a makeshift product, and while being reasonably effective in use was naturally inferior to the genuine article. Since potash is now once more readily available, manufacturers have practically ceased to make soap of this composition, and at the present time potash soft soap of a high grade of excellence, and at a relatively cheap price, is once more available.

Manchester College of Technology

Research in Chemical Warfare

A comparative statement of the numbers of students in attendance at the Manchester College of Technology was presented at the meeting of the Education Committee on Monday. University students on May 1, 1921, numbered 635, as against 757 last year, and the part-time students were 5,211, against 4,546. Of this year's number 5,008 were evening students. The total number of students at the College was 5,846, against 5,320. The minutes of the Technology Sub-committee contained a recommendation that authority be given for certain structural alterations in the College in connexion with research work at a cost of £70, which would be borne by the Chemical Warfare Committee.

Mr. R. J. Davies objected to this work of the Chemical Warfare Committee for the Government being done at the College, because it was research into the manufacture and use of poison gas in war. He had seen thousands of cases of men suffering from the effects of the use of poison gas, and he had made up his mind that he would do all he could everywhere and always to prevent its use. He moved that the matter be referred back for further details to be supplied to the Committee

Mr. Woollam said they all knew Mr. Davies' views not only as to poison gas for the purposes of war, but as to other materials. They ought not to send the matter back. It was for scientific research, and the Government knew what were their requirements.

Mr. Melland supported the amendment, but Dr. Ree, opposing it, said the expenditure on research had nothing to do with poison gas. The products to be investigated were not gaseous. In reply to Mr. Davies, he admitted the minutes of the report of the Chemical Warfare Committee referred to poison gas, but said that was an error. If the Government asked them to undertake important scientific work at the College it was a great compliment to the institution. They should not turn down a request to undertake work of great national importance.

The amendment was lost.

Manufacture of Food Products from Vegetable Oils

By H. Tefft

In a paper delivered recently before the Montreal and Toronto Sections of the Society of Chemcial Industry, the author discussed the subject of Vegetable Oils with special regard to the manufacture of food products. The substance of the paper is reproduced below.

ROUGHLY speaking vegetable oils can be divided into two classes, domestic and Oriental. The domestic oils, *i.e.*, produced on the North American continent, are cottonseed, linseed, peanut, castor, corn and sun-flower. The Oriental oils are coco-nut, palm, palm-kernel, soya-bean, rape-seed and peanut. There are also a number of other Oriental oils, but they are produced in such small quantities that they are as yet comparatively unimportant commercially. The Philippine and South Pacific Islands and the Malay Archipelago are the big producers of copra oil and coco-nut oil. Palm oil and palm-kernel oil come chiefly from Africa, and soya-bean, rape-seed and peanut-oil from China. Of the oils produced upon the North American continent, Great Britain manufactures large quantities of cotton-seed from Egyptian and Indian cotton-seed. The oil produced is inferior to the American oil on account of the deteriorated condition of the seed when it arrives at the English mills.

Another classification of these same oils is commercial oils and edible oils. By commercial oils, are meant oils that are used for manufacturing some inedible product, such as paint. Divided in this manner, the edible oils would be cotton-seed, peanut, corn, sun-flower, cocoanut, palm, palm-kernel and soya-bean. The commercial oils would be linseed, castor and rape-seed. Some of the oils are in both classes. For example, cotton-seed oil is used in the manufacture of soap. There are also attempts being made to produce edible linseed oil.

Edible Vegetable Oils

As the writer has had very little practical experience with the manufacture of commercial oils as above defined, statements in this paper will be confined to the edible vegetable oils.

Most of the oils mentioned are obtained from the seed of the corresponding plant and there are three principal methods. Extraction, expeller pressing and hydraulic pressing or combinations of the three methods. Of these three methods probably extraction is the least used. It consists of treating the seed with a volatile solvent which is afterwards dist lled off, leaving behind the oil in question. The disadvantages are loss of solvent and contamination of the oil with the solvent.

Cold-pressed oil is made by feeding the cleaned seed into a special type of press and obtaining the oil direct. For some reason or other this apparently very simple method has not displaced very rapidly the older hot-pressing method. One of the disadvantages is that the residue obtained after the oil is expressed, contains the hulls of seeds and consequently is not as desirable as a cattle food.

The oldest method and the one most generally in use is the hot-pressing method. In this method the seeds are cleaned and the meats removed from the shells or hulls, and these meats are then given a slight cooking to burst the oil cells and the cooked meats are folded into camel's-hair cloth and subjected to pressure in a hydraulic press. Afterwards the contents of the press cloths are shaken out, ground and used for cattle food.

The three methods, as above outlined, apply more particularly to the manufacture of cotton-seed oil, but in a general way they apply also to sun-flower, soya-bean, linseed, castor, palm-kernel, and rape-seed oils. In the case of corn-oil, the oil is obtained from the germ of the kernel of corn after both hull and meat have been removed. Coco-nut oil is obtained from copra, which is the dried meat of the coco-nut, and the quality of the oil obtained varies almost directly with care and method of drying. Some copra is sun-dried, some fire-dried; and in some places the copra is boiled on the spot and oil skimmed off the top of the water as it accumulates. Palm oil is made from the outside fleshy part of the fruit of the palm tree. As this part of the fruit has to be removed in order to obtain the kernels for palm-kernel oil, palm oil is made in the Orient only. In the case of peanut oil, the peanuts after being shelled, blanched and degermed, are given a preliminary pressing in an expeller press and the oil obtained is a virgin oil, *i.e.*, an oil capable of being used for edible purposes without any subsequent treatment. The cake from the expeller press is then ground, cooked and put through a hydraulic press to obtain the remaining oil in the original peanuts.

Most vegetable oils are shipped in their crude form from the many places where they are produced to some central point, where they are refined into a more finished product. When these vegetable oils arrive at the oil-refinery they are graded according to acid and also colour and flavour of the refined product. Ususlly, these characteristics go up and down together, *i.e.*, a high acid crude oil will give a dark coloured off flavoured refined oil. Hence, the first and easiest step is to run an acid test upon the oil and from that obatin an indication of what the finished quality of the oil will be and of what treatment the oil needs. The next step is to treat the oil on a laboratory scale in just the same manner as the oil is to be treated in the plant. If the first treatment does not give the desired results, another test is run with the treatment varied, and so on until one has definitely determined just how to handle the oil in the plant. This sounds like a rather slow method, but as a matter of fact, the refiner can determine almost at once from past experience just what course to follow and usually one or two tests are sufficient.

Methods of Refining

In the refining of oils the method almost universally employed is to agitate the oil with a solution of caustic soda, allow the resulting soap to settle and syphon off the supernatant oil This procedure neutralises the acid in the oil, coagulates the albuminous material, and, in settling, drags down what meal or other foreign matter there may be in the oil and leaves an oil comparatively pure and neutral. A certain amount of original colour in the oil is also removed at the same time. This neutralised oil, after being syphoned off, is clarified by further settling, and is then mixed with some bleaching reagent such as fuller's earth or filt-char, and pumped through a filter press which removes the bleaching reagent and leaves the oil clear and relatively colourless. The oil is then run into a deodoriser and blown with steam at a high temperature, which action removes the disagreeable odours and flavours and renders the oil palatable. Certain oils, on account of their mild flavour, are suitable for salad oils. They have to undergo further treatment after the deodorising to remove the stearine which solidifies at the lower temperature. The first step in this process is to artificially chill the oil by refrigeration, which crystallises out the stearine. The mixture of stearine and oil is then put through a filter press, which allows the oil to run through and retains the stearine. This gives an oil liquid at fairly low temperatures and capable of making a smooth salad dressing.

There are some patented modifications of the alkali treatment which are used by some refiners upon payment of a royalty. One of these is the Chisholm process, in which silicate of soda is added to the caustic soda. It is claimed for this process that the silicate of soda consolidates the "foots" resulting from the refining and reduces the amount of shrinking due to oil being entrained and carried down with the soap. As against this, refiners who have used the process say that the resulting oil is not as light in colour as when silicate is not used.

Another modification of the caustic soda method is the Baskerville process. In this process, a percentage of some form of cellulose, such as cotton linters, is added to the oil along with the caustic soda, and then later a percentage of soda ash is added and the whole mixture pumped through a filter press to separate the oil from the "foots." They claim for the process a saving in shrinkage and a saving in time required for completing the operation. With the ordinary

process of alkali treatment, the "foots" is slimy in nature, so that it would be impossible to separate it from the oil by filtering and so it is separated by settling, which takes at least twelve hours. The Baskerville process is claimed to produce "foots" of such a character that they can be separated from the oil immediately by filtering. Hence, an oil refinery with a given equipment could put through twice as much oil with one process as with the other. One of the objections to the process is the disposition of the cellulose in the "foots"; there is also a slightly increased cost in chemicals used over the old method.

The matter of shrinkage is a very important one to a refiner. An average shrinkage for a season, year in and year out, is nine per cent. This is over and above the theoretical shrinkage, and one can readily see that where a refiner is handling millions of pounds of a product, a very small saving in shrinkage soon effects a monetary saving.

"Foots"

The settlings from the refining of the oil by the addition of the caustic soda are called "foots." "Foots" consist of neutralised fatty acids, coagulated albuminous matter, dirt and other such impurities, precipitated colouring matter, saponified oil, and unsaponified oil entrained in the "foots." Formerly, "foots" were either pumped to a tank car and shipped to the soap maker or cut with sulphuric acid and the resulting fatty acids or "black grease" sold to the soap maker. But recently the Sharples Specialty Co. have perfected a process whereby these "foots" are diluted with water, and this diluted "foots" runs through their supercentrifuge separators and a certain proportion of the unsaponified oil which is entrained in the "foots" is recovered. The diluted "foots" that passes through the Sharples machines, after the free oil has been removed, is cut with sulphuric acid and made into black grease. This process is one of the most important improvements on the old method of refining that has been developed in recent years.

Hydrogenation of Oils

Another development in the oil and fat industry in recent years is the hydrogenation of oils. Briefly, the process consists of blowing hydrogen through the hot oil in the presence of some catalysing agent such as nickel. The hydrogen combines with the oil and changes it into the harder forms of fat. This invention has had a wonderful effect upon the oil and fat industry. For one thing, it has made the soap manufacturer independent of the supply of harder fats, as he can buy softer oil and harden according to his needs. Furthermore, certain oils and fats which could only formerly be used for inedible purposes on account of disagreeable flavours which could not be otherwise removed, are so improved by hydrogenation that they are being now used for edible purposes.

There are a few uses for vegetable oils, which are so well known that it is hardly necessary to enumerate them, such as for the manufacture of paints, soaps, candles, lubricants, shortenings and oleomargarines. However, there are other uses of vegetable oils which are not so well known. For instance, rape-seed oil is used for the preparation of sanctuary oil, which is burned in churches instead of wax tapers. It burns at all temperatures and with a smokeless flame. Palm oil is used for coating sheet iron before it is galvanised. Coco-nut oil is used in the filling of chocolates. The soot from the burning of sesame oil is used in the manufacture of Indian inks. Vegetable oils are also used in insecticide sprays, perfumery salves, ointments, liniments, artificial milk and cream, ice-cream, linoleums, putty, fly-paper, and rubber substitutes. In the packing-house industry vegetable oils are used for the manufacture of shortenings, oleomargarines, and nutmargarines.

In the case of shortening, the process consists of melting together a mixture of an oil such as cotton oil and a harder fat such as oleo stearine and running this mixture in a melted condition upon a revolving hollow cylinder, through which is pumped chilled brine. The cold cylinder, or roll, as it is called, chills the mixture instantly, and after it is chilled this mixture is automatically scraped off the roll, dropped into a trough, mixed into a homogeneous mass and pumped to the packages in which it is to be shipped. The proportion of oleostearine or similar hard fats in the mixture depends upon the season of the year and the locality to which the shortening is to be shipped.

Oleomargarine

Oleomargarines and nutmargarines are made by melting a suitable mixture of oils and fats, milk or butter and chilling this mixture by spraying in cold water. The chilled or crystallised fat is placed in trucks and held at a suitable temperature until it has ripened, *i.e.*, taken on a butter flavour. It is then put through a butter worker where the necessary amount of salt is added and the surplus water removed. Nutmargarines are made in a similar manner, the difference in the two being the formula and the colour. Nutmargarines contain no animal fat and are white in colour. Oleomargarines contain a certain percentage of oleo oil and are made as close to the colour of butter as possible, without, of course, the use of butter colours.

The scarcity of fats during the war compelled manufacturers to seek new sources of raw material for their purposes, and in many cases they had to seek what had formerly been considered inferior raw material. This led to improvements in the technique of refining oils with the result that new uses were found for these oils, and the demand for them was stimulated. An illustration of this is shown in the increased importations into North America of copra and coco-nut oils. In 1907 there were imported into North America, 7,064,532 lb. of copra and 35,544,356 lb. of cocoanut oil, while in 1918 the importations were 486,996,112 lb. and 259,194,853 lb. respectively, thirteen times as much. To show the magnitude of the coco-nut oil industry, one concern alone in Java is capitalised at $16,000,000.00.

The vegetable oil business offers immense opportunities for research and improvements in methods. There is a scarcity of definite knowledge concerning what happens in some of the operations in the refining of oils. Just why it is that Fuller's earth takes the colour out of oil and why does caustic soda take out some colour, too, when it neutralises the acid in the oil? What are the disagreeable flavours and odours in oils? Is there not some other better method of neutralising acid which will not carry with it so much of a loss of unsaponified oil? Perhaps if we find out what is actually happening we can devise a better method. We very often receive an oil upon which, in spite of the greatest care in handling, we cannot obtain conclusive results either in the laboratory or factory. It always seems as if there was some factor over which we had no control except by chance.

Indigo Industry in Assam

Marketing Methods Described

THE following information regarding the marketing of indigo as paste is taken from the *Note on the Development of the Indigo Industry in Assam*, published by the Agricultural Research Institute, Pusa:—"The demand for cake indigo is a very limited one, and if the output of indigo from Assam becomes sufficient to supply a considerable proportion of the wants of the Far Eastern market, the indigo would have to be marketed in the form of standard paste containing about 20 per cent. of indigotin. The difficulties which formerly stood in the way of preparing such paste have been overcome, and it is possible now easily to prepare a stable standard paste which can be packed in drums and will keep for any length of time for purposes of export. If the production of indigo in Assam becomes sufficiently considerable to meet Chinese demands, the organization of the industry to produce paste on a large scale will be necessary. Large factories working 1,000 acres or more of indigo could probably with advantage run their own paste producing plant and staff.

In the case of smaller concerns working only 200 to 500 acres of indigo it would be necessary to establish paste making centres, at which the produce of several factories, in the form of slabs of hard pressed material, could be collected, paid for on analysis, mixed into standard paste, and sterilized in drums for the market. This organization would also have to undertake the manufacture and supply of suitable drums in which the paste could be sent out to Far Eastern markets.'

On May 14 four oil tank steamers, carrying between them six million gallons of CRUDE OIL from the Persian Gulf and the United States, were berthed simultaneously at Swansea; the oil was immediately pumped to the refineries of the Anglo-Persian Oil Co., Ltd., at Skewen.

Reviews

CHEMICAL TECHNOLOGY AND ANALYSIS OF OILS, FATS AND WAXES. Vol. I. By Dr. J. Lewkowitsch, M.A., F.I.C. Sixth edition. Entirely rewritten and enlarged. Edited by George H. Warburton. (Macmillan & Co., Ltd., 1921. Pp. 682. 36s. net.)

This well-known treatise on oils and fats, originally published in 1895, as a translation of the German work by Benedikt and Ulzer, may fairly claim to be the standard English work of reference on the subject.

In the third edition it was entirely recast and extended, so as to include the technological side of the subject, and the fourth edition was further enlarged into three volumes, of which the first dealt with chemical theory and with the description of analytical methods, while the other two volumes were concerned with a description of individual oils, fats and waxes, and of technological methods respectively.

At the time of writing only the first volume of the sixth edition has appeared, and the present review is therefore only concerned with the theoretical and analytical portions of the subject. It is claimed on the title page that the present edition has been entirely rewritten as well as enlarged, but there seems little justification for such a claim.

It is now eight years since the previous edition appeared, which is double the interval of time which occurred between the fourth and fifth editions, yet the actual enlargement in the present case is confined to 14 pages, as compared with 126 pages between two former editions.

In the preface Mr. Warburton states that the purely scientific as well as the analytical aspects of the subject have, since the last edition, been somewhat neglected by investigators. This is no doubt true to some degree, but we have been disappointed to find that in numbers of instances the results of recent investigations have been omitted or dismissed with a bare allusion or a footnote.

Thus, the recent work of Chapman and Tsujimoto on the remarkable hydrocarbon occurring in certain varieties of shark liver oil (termed *Spinacene* or *Squalene*) is confined to a note in a table in page 612.

In view of the large proportions of this substance which occur in some varieties of the oil and of its great interest from a theoretical point of view, owing to its high degree of unsaturation, the work of these investigators surely merits a more extended notice.

Incidentally, in a previous paragraph which states that in order to prepare sufficient quantities of hydrocarbons for examination, it is necessary to work with very considerable quantities, stands in need of modification.

On page 156 it is stated that caproic and capric acids occur in coco-nut oil and no reference is made to the work of Bömer (*Z. Nahr. Genussm.* 40, 97-151), who failed to find either of these acids present in the oil.

In the description of the acetyl value, no reference is made to the work of Grün, who found that there was a tendency to the formation of inner anhydrides in this reaction during the boiling of the acetic anhydride, and advocated the acetylation of esters of the fatty acids.

In the chapter on the Reichert Meissl process and on the estimation of the insoluble volatile fatty acids in an oil or fat, there appears to be no reference to the work of Elsdon (*Analyst*, 1917, 42, 298), who extended the Reichert Meissl process and by a modification of the Shrewsberry and Knapp methods obtained useful indications in cases of adulteration with coco-nut and palm-kernel oils. Further, in this connexion, we find no reference to the work of Blichfeldt (*J.S.C.I.*, 1919, 38, 105).

Under the description of the bromide test, on page 488, it is stated that *Gemmell* examined the method exhaustively. No details are, however, given as to the results which he obtained and the modification in the method which was the outcome of his research. This is the more unfortunate as the method described has been shown to be in many respects entirely unsatisfactory.

On page 380, under the heading of solubility, the statement that "the study of the solubilities of oils and fats for the purpose of analysis is still a desideratum" has been allowed to remain, notwithstanding the fact that an extended research on this subject has been carried out by Fryer and Weston (*Analyst*, 1918, 3), who showed that the figures obtained by various investigators in the Valenta test were practically without value, owing to the fact that the acidity of the oil tested was not ascertained and that no reliable method was used for standardising the acetic acid. None of the figures or conclusions arrived at by these investigators are given and the only data included are now to a large extent obsolete.

Other instances of the omission of recent work and the inclusion of methods and data which are either quite unreliable, or have been superseded, might be given, but sufficient evidence has been adduced to show the inadequacy of the present revision. This is the more to be deplored as the previous editions have been very carefully revised and kept up to date. If it is objected that the present size of the volume makes further enlargement undesirable, it should be emphasised that a very considerable portion of the book is devoted to methods and data which, although doubtless of interest from an historical standpoint, might without detriment be greatly condensed, if not altogether eliminated.

We conclude with an extract from the preface of the third edition, written by Dr. Lewkowitsch, which we venture to commend to the consideration of the present editor:—"It need hardly be pointed out that all the new analytical matter which has been accumulated since the publication of the last edition has been embodied in the work. Obsolete methods and obviously unreliable processes have been omitted, my object being to offer, as far as I am able, to the analysts and technical chemist, guidance and assistance such as the reader looks for in a work of this kind." P. J. F.

DRUGS IN COMMERCE. By J. Humphrey. London: Sir Isaac Pitman & Sons. Pp. 116. 3s. net.

This volume, which is more or less of pocket size, is one of the latest additions to the "Common Commodities and Industries" series already consisting of about 50 volumes dealing in a simple but engaging manner with a variety of technical subjects and everyday products. In each case a commencement is made with the raw material utilised; its history and formation are described, and the development of the product is traced out until it becomes a commercial commodity, and so on through the various phases of its sale and purchase. The author in this instance deals solely with the preparation of the chief drugs of vegetable and animal origin, the host of synthetic preparations being without the scope of his volume. The word "drug," in fact, is employed generally in its original sense; that is, a dried animal or vegetable substance which is utilised for medicinal purposes. It is noteworthy that the majority of the drugs in common use in this country are imported from all parts of the world, London being one of the main ports of entry. The subject is, perhaps, not one of the easiest with which to deal in popular vein, and the author has elected to serve up his material more or less in dictionary form which, while rendering the information highly accessible, deprives his narrative of continuity and tends to make the reading a little uninteresting. C. A.

THE ELECTRONIC CONCEPTION OF VALENCE AND THE CONSTITUTION OF BENZENE. By Harry Shipley Fry, Ph.D. Monographs on Inorganic and Physical Chemistry. 1921. London: Longmans. Pp. 300. 16s.

THE present volume is an embodiment of views which have been put forward from time to time in the pages of the *Journal of the American Chemical Society*, and are now collected in the form of a consecutive narrative. It may be stated at the outset that the theory is of so versatile a character, is capable of being modified in so many ways, that it requires little ingenuity to make it fit in conveniently with almost any experimental fact.

The electronic conception upon which the author explains various reactions, more especially the behaviour of benzene in substitution, is based upon Sir J. Thomson's theory of the electronic nature of valency. Valency bonds are regarded as playing the part of Faraday tubes, and chemical union between atoms is effected by loss or gain of electrons. Now, according to the author, an atom may both lose or gain one or more electrons according to its valency, and, therefore, may function both as a negative and positive atom.

In the molecules of simple gases like chlorine one atom loses and the other gains an electron,

$$\overset{+}{\mathrm{Cl}}+\overset{-}{\mathrm{Cl}}=\overset{+}{\mathrm{Cl}}-\overset{-}{\mathrm{Cl}},$$

Thus, a monovalent atom may function in two ways. A bi-valent atom such as oxygen with two positive and two negative charges may function in three ways :

$$\overset{+}{\overset{+}{\mathrm{O}}} \quad \overset{+}{\underset{-}{\mathrm{O}}} \quad \underset{-}{\overset{+}{\mathrm{O}}}$$

A tri-valent atom in four ; a tetravalent atom (carbon) in five, and so on.

Consequently, a compound of the elements X and Y may be represented by two formulæ termed *electronic tautomers* or *electromers*, which take the following form, and are represented as being in equilibrium.

$$\overset{+}{\mathrm{X}}-\overset{-}{\mathrm{Y}} \rightleftarrows \overset{-}{\mathrm{X}}-\overset{+}{\mathrm{Y}},$$

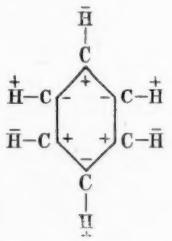
in which X gains or loses an electron and Y behaves in the inverse way.

Here we have the main, though by no means all the possible, conditions foreseen by the theory.

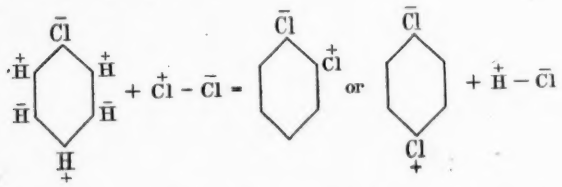
By way of illustration we will apply it to a simple case of benzene substitution.

It is well known that certain elements or groups enter the ortho and para position to the original substituent, others mainly in the meta position. Chlorobenzene on chlorination yields a mixture of ortho and para but no meta derivative.

The author's electronic formula for benzene appears as follows :—



The action of chlorine on chlorobenzene is represented in the following way :—



But how comes it that the first chlorine atom is negative ; for one would naturally expect it to replace a positive hydrogen in order that the negative chlorine might unite with the positive hydrogen, which is eliminated ?

Electronic tautomerism is brought into action. Chlorobenzene may exist as an equilibrium mixture, thus :—

$$\mathrm{C_6H_5}\overset{+}{\mathrm{Cl}} \rightleftarrows \mathrm{C_6H_5}\overset{+}{\mathrm{Cl}}.$$

One may select then the form which most conveniently suits the case. This single example must suffice.

It is, of course, impossible in a limited space to do adequate justice to Dr. Fry's theory. It may and probably does contain a positive nucleus of truth ; but it is one of such a very plastic nature, so easy to mould into any desired shape, that it cannot well be submitted to any form of rigid test, and the view so very lucidly put forward seems rather to partake of the character of an ingenious and interesting speculation, than of a working theory capable of experimental verification or disproof.

INORGANIC CHEMISTRY. By E. I. Lewis, M.A., B.Sc. Cambridge University Press. 9s. net.

The book was written primarily for a class of boys some of whom had been promoted from a lower science set and the rest had come over from the classical side. An endeavour was made to follow " the strictly logical method " and the arrangement differs radically from that of the ordinary textbook, but this leads to what are really kindred subjects being unnecessarily divided.

Useful features are the problems at the end of each chapter and notes for revision, and the suggestions for further reading and references to other books and journals in which further information may be found. There is an excellently written section on the periodic classification of the elements, and a very useful summary of modern views on the stability and structure of the atom.

Manufacturing processes and applications of chemistry are in the main omitted, but in one or two instances where outlines are given certainly alteration is required as the statements are incorrect. For example, when petroleum is further distilled paraffin wax is *left*. Again, sometimes shales contain so much *petroleum* that they are worth distilling. Under a sub-title " another illuminant " the reaction of *super-heated* steam on anthracite is given.

The book is illustrated by really excellent diagrams, and it provides a very thorough grounding in the principles of chemistry, but to work through it systematically and carry out the bulk of the experiments personally would demand more time than the average youth has for the study of the subject. J. S. S. B.

A TEXT-BOOK OF DYE CHEMISTRY (The Chemistry of Dye-stuffs). By Dr. Georg von Georgievics and Dr. Eug. Grandmougin. Translated and revised from the fourth German edition (with additions) by Frederick A. Mason, M.A. (Oxon.), Ph.D. (Munich). London : Scott, Greenwood & Son. Pp. 460. 30s. net.

An English translation of this important work on the Chemistry of Dye-stuffs will no doubt be heartily welcomed by the large numbers of English and American chemists now connected more or less intimately with the growing dye industry.

We believe it is at length realised by the intelligent and observant citizen that the establishment and prosperity of this industry and the allied one of Fine Chemicals are a necessary insurance against a possible war, making, as they do, for national independence. The study of Organic Chemistry, therefore requires to be encouraged, and the chemist must read and study diligently books of authority such as the one under review.

An English translation is all the more welcome owing to the war having, for a time at any rate, curtailed the facilities, and probably also in many cases the inclination, for post-graduate study at the German universities, renowned for their researches in the field of Organic Chemistry. The number of English chemists who will prefer to read the text-book in its original German will thus be somewhat limited. Readers of the English translation, furthermore, will greatly benefit by the additional matter furnished by Dr. Mason in bringing the subject up to date and by the most useful bibliography provided.

We note that tables have been added to the text indicating the relationships of the various derivatives of benzene, toluene, naphthalene and anthracene. The printing of the graphic formulæ in these tables is not carried out in the best style, however. The chapters on quinoline dyes and coal tar have been rewritten and new sections dealing with anthocyans, carminic acid and curcumin have been introduced. At the end of the book there is an interesting chapter on the synthetic dye industry, treated as a whole.

Naturally, a good deal of space is devoted to the discussion of constitutional formulæ and to the methods of synthesis of important dye-stuffs. In the chapter on azo dyes the question of constitution might have been with advantage more fully explained. The nature and manufacture of intermediates are described in the merest outline, more attention being given to the dye-stuffs proper. Indigo is treated at great length, but we fail to find any note of one of the more recent processes of manufacture adapted in Germany.

Prices where stated are not always clear as to whether they refer to pre-war or present conditions.

The testing of dye-stuffs is disposed of very briefly. We think it would have been greatly appreciated if this short section had been considerably extended.

The translation, which is entirely new, is well written, bearing little trace of Germanised English—a common failing of translators. Printing and paper are of a high-class character. Altogether the book is to be highly recommended as a text book of dye chemistry, which it professes to be. W. B. D

Treatment of Oil Bearing Products

The Solvent Extraction Process

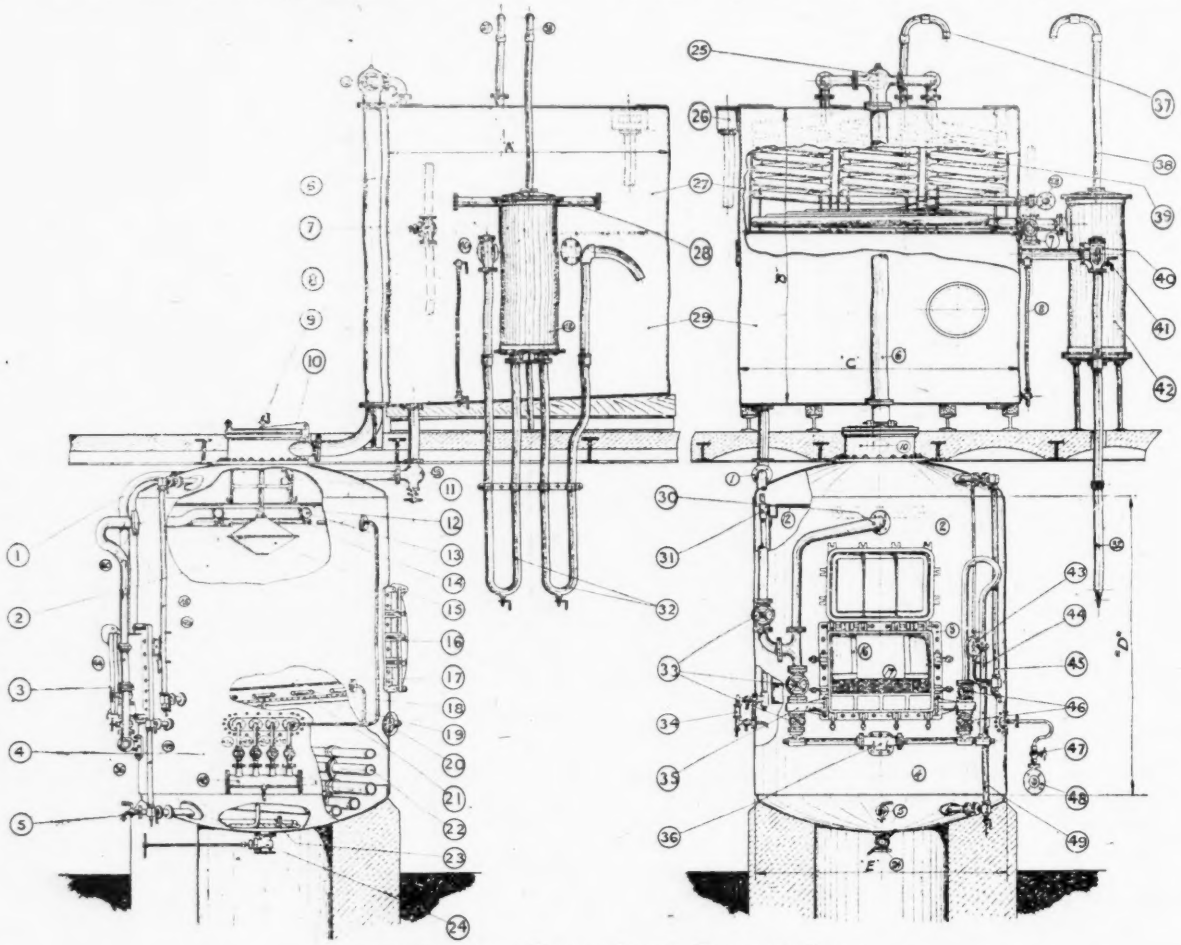
ALTHOUGH oils, fats and waxes can be obtained either by the "expression" or "solvent extraction" methods, the general consensus of opinion appears to be in favour of the latter as being the most efficient method of extracting oil.

The disadvantages of the expression method are largely on account of the expensive nature and working of the machinery employed. The large percentage of oil contained in press-cakes obtained by the hydraulic process reduces their value as a cattle food, and where, as in the case of press-cake obtained from castor seed, the cake is used as a fertiliser, the high oil-content prevents the earth from acting on the phosphates which are present. Excessive oil content in press-cakes also tends to cause rancidity when stored, especially in warm and damp climates.

The plant used in the solvent extraction process, however, is generally considered to be much cheaper, both from the point of view of capital outlay and labour costs: it is also claimed that by this method practically the entire oil content of the seed is obtained.

We reproduce on this page a sectional drawing of the "Standar" patented solvent extraction plant which is manufactured by the Standar Chemical Engineering Co., Ltd., of 21, Panton Street, London, S.W.1, who specialise in the construction of plants for oil extraction by the solvent process. This plant consists of a large cylindrical tank, a rectangular tank, and a small cylinder. A diaphragm plate divides the former, which is provided with two false sides into two portions, the extractor, 2, and the distiller, 4. The rectangular vessel is also divided into two compartments which form the condenser, 27, and the solvent reservoir, 29. The small cylinder is an automatic separator, 42, and deals with condensed solvent vapours and steam.

The raw material for treatment is suitably prepared for extraction, and is then charged into the extractor vessel, 2, through the charge door, 10, and rests on a double set of perforated plates, 17, between which are placed filter cloths. A conical shaped valve, 15, distributes the material over the extractor surface, and is subsequently used to prevent material from rising into the trunk pipe, 11.



SECTIONAL VIEW OF THE STANDAR SOLVENT EXTRACTION PLANT.

In the case of downward extraction, the charge door, 10, is closed after charging, and the solvent—which may be "light," such as benzine and benzole, or "heavy non-inflammable," such as trichlorethylene—is admitted through the solvent pipe, 1, control valves, 33, the solvent inlet, 30, and the sparge ring, 13. Passing from the sparge ring the solvent is heated by a twin steam-coil, 14, which is so arranged that all the solvent entering through the sparge ring must flow over it. The material is covered by the solvent, and is simultaneously being heated by the closed steam-coils, 18. When the oily content has dissolved, the solution consisting of oil and solvent is run off into the distiller, 4, through valves, 46, and a syphon, 44; a sight glass, 44, is provided for observation purposes.

Where the upward extraction method is used the solvent is admitted via the valves, 33, and an inlet tee, 35, passing into the vessel under and through the bottom perforated plates, 17; it is heated by closed steam coils, 18, passes upwards through the material and, after forming a solution, passes through the top double set of perforated plates, 12, having a filter cloth between, and flows over the false sides into the distiller. A part of this solution flows through the effluent pipe, 31, and can be observed through the sight glass, 34. In this way a continuous "flushing" is maintained until the whole oil content is extracted; the last flush is drained into the distiller by means of the valve, 46.

Whilst the "flushing" is taking place the solvent is being vaporised from the oil due to the temperature obtained from the closed steam coils, 22. The vapour rises to the top of the vessel and passes through the vapour pipe, 6, into the condenser coils, 39. The condenser coils are formed by three "pack" coils connected in parallel, and one "flat" coil connected in series with the "pack" coils, the vapours being distributed to the three "pack" coils by a header, 25. A collecting header, 28, connects the lower ends of these three coils to the uppermost terminals of the series coil, and the condensed vapours of all three coils pass finally through this flat coil into the automatic separator, 42.

The separator, 42, is entirely automatic in its action and is so arranged that it separates the condensed steam from condensed solvent; the solvent passing through the syphon, 32, flows back into the solvent reservoir, 29, while the condensed steam flows through the syphon, 32, and overflows to waste, being run into a drain.

At this stage the residue is saturated with solvent, and to drive off these last traces of solvent, "live" steam admitted through the open steaming coil, 19, is employed. It is also necessary to use "live" steam admitted through the coil, 23, to drive off the final traces of solvent from the oil, after the majority of the solvent has been distilled, by the closed coils, 22. After extraction, the residue is discharged through the doors 3 and 16, and the oil is run off from the cock, 24.

The Merz Principle

The "Standar" plant was originally based on the "Merz" principle, in which the solvent is sprayed over the top of the material, the mixture of solvent and extract being invariably drawn off at the bottom. It was found, however, that an extraction proceeding in one direction only lost in efficiency owing to the tendency of the material to form pockets, with the result that insufficient resistance was offered to the formation of passages by the solvent during its action. Manufacturers of various types of extractors were able partially to remedy this defect by the introduction of agitators and "revolving extractors." As has been previously mentioned, the upward and downward method is used in the "Standar" plant, as a frequent change of direction in extraction ensures that the material is dislocated by every change.

When a solvent heavier than water, such as trichlorethylene, is employed, the specific gravity of the solution drops according to its saturation with a consequent tendency to rise to the surface. In order sufficiently to separate the solution from the material, upward flow must be resorted to, as by drawing the saturated solution back through the extracted material a large proportion of the extract is retained by the material and has to be extracted again.

A Standar extraction installation may consist of one or a number of units; in the latter case each unit may be worked independently, or when desired, they may be worked collectively as one installation. This enables the simultaneous treatment of different products, so that palm kernels can be treated in one plant, ground nuts in another, rubber seed in a third, and so on. The "battery" system (in which a number of inter-communicating extracting vessels run together) has the disadvantage that, in the course of cleaning or repair, the remaining extractors of the battery have to be put out of action, whereas with the Standar system, each plant being an independent unit, they can be coupled together to form a battery, or work singly as desired.

The plant is manufactured in three sizes with an extractor capacity of 78, 150, and 225 cu. ft. respectively; where an oil seed of average weight is used, a plant of the largest size is capable of dealing with from 2½ to 3 tons each per charge and the time for extraction is from 8 to 10 hours.

Treatment of Bones

For the extraction of fat from bones the company have designed a special type of plant in which the fat content is attacked by means of solvent vapours only, instead of liquid solvent. In order to accomplish this the division between the still and the chamber containing the crushed bones is formed by perforated plates only.

In this process the solvent is admitted direct to the distiller chamber and is then vaporised by the closed steam coils, the vapours rising through the perforated plates and passing through the crushed bones. The latter being cold and having a certain percentage of moisture, the vapours are condensed, fall back into the still, carrying with them the fat obtained from the bones. This process proceeds until the vapours reach the top of the extractor, when, owing to the absence of any further condensation they pass off by way of the condenser, and the separator, to the storage tank.

After the majority of the solvent has passed through the bones in vapour form, live steam is admitted to drive off the last traces of solvent. The fat is then left free from solvent while the bones are dry and free from fat.

Lautaro Nitrate Company

The Need of Further Capital

AN extraordinary general meeting of the Lautaro Nitrate Co., Ltd., held on May 17th, at Winchester House, E.C., for the purpose of considering a resolution authorising the board to confirm the agreement made between the Company and Messrs. Collin et Cie, and the cancellation of the 40,000 shares therein referred to.

Mr. J. O. Herrera, who presided, said that in order to avert approaching financial difficulties, the Company would have to raise capital. Further, the board considered it a step of capital importance to confine the Company to an industrial undertaking on the same basis as all the nitrate-producing companies. As regarded the scheme contemplated, all the shareholders had the same rights in proportion to their holdings. The syndicate with which the Company was negotiating was not a stranger with opposite interests to the Company. It was necessary to separate the dealing in nitrate in Europe from their industrial enterprise, the more so if that operation would facilitate their raising the necessary funds to relieve the company of its pressing liabilities by the voluntary contribution of its own shareholders. The prospects for the 70,000 shares which would remain as the Company's capital were very encouraging, while, on the other hand, the board had endeavoured to secure equally encouraging prospects for the shares which they were entitled to get in the new company. They considered it a substantial advantage to surrender their shares at a valuation of £12 while their market value was below £8.

After some discussion the resolution was agreed to, the Chairman having previously agreed to meet a committee of shareholders in order to give more detailed information as to the position.

Scientific Glassworkers' Protest

ON behalf of the employees of Duroglass, Ltd., Walthamstow, Messrs. E. W. Agg, B. Smart, R. Thomson, and S. Brush have addressed a letter to Mr. Lyle Samuel, M.P., protesting against the suggestion which they find in a speech made by him in the House of Commons on May 12 that nearly all the workmen engaged in the manufacture of scientific glassware, and certainly all the efficient workmen, are foreigners. "We most emphatically deny," they say, "that there any any foreigners engaged in these works, and maintain that our skill is equal to that of any foreigner with equivalent experience. Our factory is open for inspection by arrangement at any time, and we must ask you forthwith to make the necessary apology, in a suitable manner, contradicting the statements you have made."

It is reported that Dr. Paul Kappelmeier, who has for ten years held the position of CHIEF CHEMIST to the Höchster dye factory at Frankfort, has been arrested on the charge of betraying factory secrets, the commercial value of which is stated to approximate £3,750,000, to an American company.

British Cotton-Seed Products

Formation of an Indian Company

SPEAKING on Monday at the first annual general meeting of British Cotton-Seed Products, Ltd., the chairman (Viscount Doneraile) referred to the industrial and economical unrest that had characterised the latter part of the year 1920, and was responsible for the delay in the construction and erection of the plant and machinery at the premises the Company had acquired at Chatham.

The company, he said, had acquired additional rights for the "Segundo" cotton-seed defibrating machine on very satisfactory terms, and it was considered that some of these rights might acquire considerable value in the future. The company now owned the world's rights for this machine, except in the United States of America. On the date of the balance sheet the company held £70,000 of 6 per cent. Treasury Bills and £5,000 in cash, and that was approximately the position to-day.

Arrangements for the formation of an Indian company to acquire the Indian rights from the company were well advanced. The memorandum and articles of association, and also the prospectus for the Indian company, were now being prepared, and the directors were of opinion that it would be found possible to launch it before the end of the present year. The premium on defibrated seed adopted in the prospectus was very much less than that ruling at the time the company was formed, and the directors were advised that even at the lowered prices at which cotton seed was selling to-day this premium should be realised. With regard to the residual fibre, the directors saw no reason to depart from the original estimate of its intrinsic value, and much evidence had come to light since the company was formed of considerable expansion in markets for this material for purposes other than papermaking.

German Reparation (Recovery) Act

Agreement with German Government

THE Chemical and Dyestuff Traders' Association is officially informed that an agreement has been come to between this country and Germany under which the German Government will in future refund to the German exporter the amount of the Reparation levy deducted by the British Customs. Germany has undertaken to complete the arrangements for putting this agreement into force by an early date in June, and as soon as these arrangements are completed, the following conditions will apply :—

1. Where goods come direct from Germany into the United Kingdom the importer pays 26 per cent. of the value to the British Customs and the remaining 74 per cent. to theGerman exporter.

2. Where goods come from Germany through neutral countries into the United Kingdom, these will not be taxed by the British Customs authorities, as the German Government will collect the tax before they leave Germany.

The Association has also received the following from the Customs authorities :—

"By Treasury Minute under Section 1 (1) of the German Reparation (Recovery) Act, 1921, the proportion of the value of German goods as defined by the Act which is to be paid to the Commissioners of Customs and Excise has been reduced to 26 per cent. until further notice. This reduction applies only to goods which are imported by vessels arriving within the port of discharge at any time later than midnight of the 12th/13th instant.

"With regard to Notice No. 60, if the amount to be paid to the foreign seller exceeds 74 per cent. of the invoice price, the value on which the levy is payable will be a sum which, after the deduction of 26 per cent., represents the amount to be paid to the foreign seller ; *e.g.*, if the invoice price is £100, and the whole of that price is to be paid to the foreign seller, the value to be shown on Form 140 (Sale) will be approximately £135 2s. 8d.

It is reported that an agreement has been reached between the Chilian Government, delegates of the Chilian nitrate producing interests, and a representative of those holding stocks of nitrate in Europe, with the object of meeting competition by REDUCING THE SELLING PRICE OF NITRATE to foreign consumers.

Developing Petroleum Oils

New Company Formed in France

PARTICULARS are issued, in accordance with Stock Exchange Regulations, of the Société Générale des Huiles de Pétrole "Petrolor," a new company under the joint control of the Anglo-Persian Oil Co. and a large French syndicate, who have jointly subscribed a total share capital of 100,000,000 francs (£4,000,000 at par value of exchange) for the purchase, importation, stocking, refining, transport, sale and re-sale in France proper, the French Colonies and Protectorates and countries under French control, of mineral oils of all kinds, and their derivatives and by-products, and the investigation, survey and working, in the said countries, of all deposits of mineral oil of all kinds. The company will also undertake the refining in France of imported or indigenous crude petroleum, and for this purpose one or more refineries will be established. The company will also create an up-to-date organisation throughout French territory for the distribution of petroleum products. Under an arrangement with the Anglo-Persian Oil Co., Ltd., the company has secured for a period of 20 years the supply of large quantities of oil on favourable terms.

Arrangements have been made with the British Tanker Co., Ltd., for the charter of tankers, and a subsidiary company is being formed to acquire a fleet of tankers flying the French flag, which will be under the management of the Société Navale de l'Ouest. Two of these tankers are already afloat, and six others of about 10,250 tons each are being constructed in French and British shipyards.

The capital is divided into 200,000 shares of 500 f. each and 100,000 deferred shares without nominal value. A French Syndicate (embodying, amongst others, the Société Navale de l'Ouest, and called Syndicat Général des Huiles de Pétrole) and the Anglo-Persian Oil Co., Ltd., have received 20,000 fully paid shares in the company, the whole of the deferred shares and the sum of 18,392,900 f. in cash. The remaining 180,000 shares have been entirely subscribed in cash at par under the guarantee as to 55 per cent. of the French syndicate above mentioned and as to 45 per cent. of the Anglo-Persian Oil Co., Ltd.

Sir Charles Greenway, chairman of the Anglo-Persian Oil Co., is joint vice-chairman with Sir Basil Zaharoff.

The Institute of Metals

Annual Autumn Meeting in Birmingham

THE Council of the Institute of Metals have issued further particulars of the previously announced annual autumn meeting which will take place in Birmingham on Wednesday, Thursday and Friday, September 21, 22 and 23. A reception committee presided over by Sir Gerard Muntz, Bart. (Past-President), and of which Mr. G. W. Mullins is acting as honorary local secretary and Mr. G. Bill-Gozzard as honorary local treasurer, has been formed, and has drawn up an attractive preliminary programme.

Members will assemble in Birmingham on September 20, during the afternoon of which day the honorary local secretary's office will be open for the distribution of papers and invitation cards. On September 21, at 10 a.m., there will be an official welcome by the Lord Mayor, and the remainder of the morning will be devoted to the reading and discussion of papers. After an official luncheon a visit will be made to the University Buildings at Edgbaston, where tea will be provided. In the evening there will be a reception by the Lord Mayor.

The morning of the second day will be devoted to the reading and discussion of papers, and after luncheon there will be visits to works, the evening being devoted to a garden party or other entertainment.

The concluding day of the meeting will be available wholly or in part (according to whether the morning is required for the reading and discussion of papers) for a motor excursion to Warwick, Kenilworth and Stratford-on-Avon. Sir Gerard Muntz has offered to receive the visitors at his Stratford home to tea, this hospitality concluding the meeting.

For the convenience of applicants for membership who are desirous of being elected in time for the meeting, a special ballot is being taken on July 6. The ballot will be concluded in time for members and student members so elected to participate in the Birmingham meeting.

The Salaries of Chemists

Organisation in South Africa

IN the annual report of the South African Association of Analytical Chemists, just received from Johannesburg, reference is made to the movement for raising the status and improving the remuneration of chemists.

The sub-committee on "Chemists in Private Employ," after full consideration of the matter, recommended that a letter should be sent to all employers of chemists, pointing out the advisability in their interests of only appointing properly trained and qualified chemists at a salary commensurate with that of a professional man, and also enlarging on the satisfactory service which is obtained by employing such men as against the unsatisfactory returns from men who have not received a proper training in chemistry.

The recommendation was accepted by the Council, and as a result of the letter several replies requesting information as to the salary which should be offered to properly trained and qualified men were received. The matter was referred to the sub-committee and the reply pointed out that the points to be borne in mind in arriving at a reasonable salary to a chemist were in the Council's opinion :—

1. The salary should to some extent reflect the responsibility placed on the chemist, which in some measure was dictated by the scale on which operations were carried out.

2. Regard should be paid to a fair equality between the chemist and other technical officials (engineers, &c.) employed at the works.

3. A reasonable prospect should be held out to all qualified chemists employed in industrial concerns, so that, whatever salary may be offered on starting, the increment to salary should be such as will lead to the chemist receiving a fair professional remuneration within a reasonable time.

4. Qualified and competent chemists, who possess such training as would permit them to be Members of the Association, should be so remunerated that they can look forward to receiving a salary of not less than £750 per annum by the time they are from 35 to 38 years of age. Without emphasising the difference between the skilled artisan and the professional chemist, cases have been brought to the notice of the Association in which the chemist, after many years of valuable service, still receives a lower remuneration than is given to the artisan.

5. "Chief chemists" and chemists who have specialised in some particular branch of the profession must be paid according to their responsibilities, and such salaries are a matter for agreement between the employer and the employee.

6. The prospect of a salary of at least £750 for every competent chemist refers to what may be deemed the rank and file of the profession; for higher chemical posts correspondingly higher remuneration should be awarded.

7. In the case of junior chemists (such as might be admitted to the Associateship) reasonable increments of salary should be given and if the junior takes good and proper advantages of the opportunities which may present themselves, or which he can create, in order to qualify himself as a competent chemist, employers should, wherever possible, advance the junior to a higher grade (rising ultimately to a salary of £750 per annum) when he becomes satisfactorily competent as a chemist.

8. Such advance should not be conditional upon a vacancy occurring in the higher grade, but should be made independent of vacancies.

Vanillin from Pimento Leaves

IN his report on Jamaica for 1919-20 [Cmd. 1103-10] Mr. H. Bryan, Colonial Secretary, states that pimento was in good demand abroad and the large sum of £184,000 was received for this product, which is practically a Jamaican monopoly in the markets of the world. He states that experiments in the production of vanillin from pimento leaves are now being carried out on a small industrial scale by the Agricultural Department, an industrial chemist with special qualifications being in charge of the work. A bag of pimento leaves, weighing 60 lb., previously of no commercial value, will yield 1 lb. of an oil containing 92 per cent. of eugenol, which can be transformed readily into the isomeric iso-eugenol; the latter oil by oxidation yields vanillin.

Reparation and Key Industries

Views of Manchester Chemical and Allied Trades

THE German Reparation Act and the resolutions for the safeguarding of key industries have been under the consideration of the Chemical & Allied Trades Section of the Manchester Chamber of Commerce, and the Board has adopted the resolutions of the Section. These include the following :—

German Reparation Act

1. Since the passing of the Act, German manufacturers refuse to sell on credit, and they generally require payment of the full amount of all invoices against shipping or forwarding documents by an irrevocable credit with a German bank.

2. The duty of 50 per cent. must, therefore, in all such cases be paid by the English importer.

3. The Customs authorities in London have decided that the official reading of the Act now is that if a British importer undertakes to find the money for the tax he must pay 100 per cent. of the invoice value.

4. The effect of these regulations is practically to stop imports from Germany.

5. We are dependent on Germany for certain products which are used here as raw materials, and if these are shut out of this market they will be taken by neutral countries, such as Holland and Switzerland, where they will be manufactured into refined chemicals and other products which will come into this market free, and thus destroy the similar manufacture here.

6. The Preamble states that the Act is to provide for the application of part of the purchase price of imported German goods towards the discharge of the obligations of Germany under the Treaty of Versailles.

7. It is obvious from the foregoing that the object of the Act is in great measure frustrated, as in the event of any German goods being imported, the British importer must pay the levy, whilst if they are entirely shut out there can be no tax collected from the Germans.

In view of these facts the Section adopts the following : —

"Being in favour of exacting from Germany the utmost penalty, this Section is of the opinion that it is desirable to substitute, as soon as it may be practicable to do so without detriment to the common policy of the Allies, the import regulations under the German Reparation (Recovery) Act, by other forms of penalty on Germany."

Safeguarding of Key Industries

"That the Chemical and Allied Trades Section consider that the proposed Ways and Means Resolutions place too much control in the hands of permanent officials, and are not in the best interests of British trade."

"That the importation of products such as are manufactured in this country under the designation of Key Industries should be under the control of a Committee of the House of Commons under an independent chairman appointed by the President of the Board of Trade, together with expert representatives from trade, labour, and other organisations interested in this Committee to decide what manufactures come under the definition of Key Industries, and if any what import duties are to be imposed thereon for the ensuing twelve months and annually thereafter."

"That in order to deal adequately with the questions of dumping and the incidence of abnormal exchanges on the trade of the country, the Government be requested to appoint a Committee of the House of Commons, including representatives of the main interests affected. The Committee should be instructed to recommend measures which should be so framed as to place manufactures, so far as practicable, in a position to compete under fair and equal conditions with foreign manufacturers. It is therefore considered essential that the administration of any scheme enacted to promote the re-adjustment and restoration of trade should be carried out under the supervision of a Committee of the House of Commons appointed for such a purpose."

The bulk of FINLAND'S IMPORTS of colours, dyes and colouring matter last year was from Germany, the value of these imports amounting to 20,032,108 marks in 1920, as compared with 6,918,225 marks in 1919. The value of the imports from Great Britain in 1920, though more than in 1919, only amounted to 2,041,724 marks.

Nitrate Railways' Successful Year

Prospects of the Nitrate Industry

SPEAKING at the thirty-ninth ordinary general meeting of the Nitrate Railways Co., Ltd., held at Winchester House, Old Broad Street, on Tuesday, Sir Robert Harvey, who presided, referred to the proposed electrification of certain of the Company's lines, and in that connexion, he said, they had the support of the nitrate producers. The producers realised that the demands of the nitrate industry in recent years of very heavy production and under the altered conditions of shipment, had outgrown the capacity of the single track railway, with its great operating difficulties, and while during the present year and for probably longer the traffic would he was afraid, be small, yet when a real revival took place they would require increased facilities to deal with this traffic.

He did not think he need enlarge any more on the past year's results, except to repeat that despite its being a good traffic year, it had been one of much anxiety for the board on account of the local difficulties and the continued high cost of all materials; those two adverse factors were still largely with them, and to add to their troubles a very serious depression had occurred in the nitrate industry. Demand had fallen off almost entirely on account of former consuming countries' inability to purchase, through their exchanges being so much against them, while in the United States the fall in cotton prices had made the cotton growers nervous of adding to their production costs. It was, he said, beyond him to prophesy when a revival in nitrate would occur; it depended on how the financial situation could be met.

The total traffic of the railway in 1920 amounted to 22,758,612 Spanish quintals, against 14,212,408 in 1919, and the total number of passengers carried in 1920 was 528,268, against 411,578 in 1919; the receipts from this source totalled £79,009, or £28,370 more than in 1919. The gross receipts for 1920 were £1,009,940, compared with £485,143 in 1919, a year of stagnation in the nitrate industry, the net earnings for 1920 being £250,777, against £95,790 in 1919, an increase in favour of 1920 of £154,987. Adding to this sum of £250,777 the balance carried forward from 1919, viz., £58,311, and the small items of interest, &c., a total was shown to the credit of net revenue account of £314,660. Against this was charged income tax and French taxes, the balance of the former being reduced from £57,270 to £8,451 on account of decreased profits in 1919, and a refund of income-tax. There was also charged the sum of £7,000 depreciation written off in respect of the company's holding of National War Bonds, the expenditure on new sidings and buildings £7,224, and a sum of £75,000 transferred to the reserve for rolling stock renewals. In view of the heavy programme in this direction the usual allocation of £30,000 had upon this occasion been increased to £75,000. After charging all these items a sum of £216,350 remained. Of this amount the sum of £57,960 was distributed in November last as an interim dividend at the rate of 3½ per cent., leaving £153,390, and it was proposed to pay a similar dividend as a final distribution on account of the year 1920, making a total dividend of 7 per cent. per annum, and leaving £100,430 to be carried forward to 1921.

Oil Bearing Products of the Gold Coast

INCLUDED with the Report on the Gold Coast in 1919, issued by the Stationery Office [Cond. 1103-9] is a report of work conducted for the colony at the Imperial Institute, South Kensington. This report states that a sample of palm oil skimmings, obtained in the process of refining the oil, was forwarded from the British Zone, Togoland, in order that the possible commercial utilisation of the material might be investigated. The skimmings were found to contain over 14 per cent. of palm oil, but the extraction of this oil would necessitate the use of solvents and require special plant, the installation of which would not be worth while unless large quantities of the skimmings were available at a convenient centre at a low price.

With regard to oil from cinnamon bark, into which a previous inquiry had been made by the Institute, three further samples of the bark were examined, and found to be of very good quality. They furnished a high yield of oil, which was superior in certain respects to that obtained from Ceylon cinnamon bark.

The Case for Free Trade

Sir E. Mackay Edgar's Views

IN an article in the *Evening Standard* Sir E. Mackay Edgar discusses the present fiscal system, and puts forward his views on the safeguarding of key industries. In the course of this article he states that partly by executive decree, partly to redeem pledges and partly by the more open method of the Dyes Bill and the present Key Industries and Anti-Dumping Bills, a good deal of our established fiscal policy has been or is being steadily whittled away.

"In one sense," he says, "every industry is a key industry, because it depends upon or ministers to some other industry which could not get on without it. In another sense there is no such thing as a key industry, an industry, that is to say, complete in itself, independent of all other trades, and existing simply to provide raw material of some larger industry or to supply it with an essential process. All industries are equally essential. Are we going to base the whole of our economic life for the next generation on the prospect of instant readiness for war? That, apparently, is what the champions of the key industries desire.

"Now, admittedly, a chemical industry is an invaluable military weapon in any nation's arsenal. But still more so is agriculture. Are we, therefore, to scrap most of our industries and drive three-fourths of our people to emigrate in order that Great Britain, in time of war, may be made agriculturally independent of the rest of the world? What single industry is there the presence of which does not assist, and the lack of which does not hamper, a belligerent in waging war under modern conditions? What is there that is made or grown which has not a potential military value? If we are going to give protection and subsidies to one trade because of its possible usefulness in war-time, we shall have to give protection and subsidies to all trades.

"As for the Anti-Dumping part of the Bill now before Parliament, its purpose and effect can only be to raise the prices of all British imports to the highest level reached in the countries of the stiffest Protection. It aims at putting a premium on dearness and at depriving our importers and consumers of the advantage of getting any goods from abroad at a lower price than they are being sold to our foreign competitors. It is as powerful an incentive to the upward movement of prices as could well be imagined. It practically declares that nothing shall be cheap in Great Britain which is dear abroad."

Margarine Works Close Down

LORD LEVERHULME has closed down his large margarine works known as Planters, Godley, near Hyde. It has been stated that Planters was the first margarine works to be established in this country, and was originally run by Otto Marsted, a Dane, who was a pioneer of margarine manufacture in England. In an interview with a Press representative on Wednesday a member of Lord Leverhulme's staff said the closing of the works was in no way connected with loss of trade, but was entirely due to the fact that very large modern works, built for the more economical production of margarine, were now completed, and the business had been transferred there. Godley had neither rail nor water facilities. Consequently, the closing of the works and the transfer to Bromborough Port on the Mersey had been carried out entirely for economical production and better service to the trade and the public.

Accident to Acid Carboys

AS the result of the steering gear going wrong, a motor-lorry belonging to Spencer, Chapman & Messell, Ltd., chemical manufacturers, of Silvertown, E.16, which was conveying over fifty carboys of sulphuric acid, crashed into a tree on the Chelsea Embankment on Tuesday. The carboys were thrown into the road and smashed. The fire brigade was summoned, and their hoses were employed in washing away the acid. The driver of the lorry, William Farmer, and two boys who were sitting beside him were thrown from the lorry and splashed by the acid. Farmer escaped with slight burns on the head and face. Edward Britland, aged 11, suffering from extensive burns, together with the other boy, was taken to a hospital, where both are undergoing treatment.

Chilian Nitrate Situation

High Production Costs

THE general position of trade in Chile at present is aggravated by the unsatisfactory condition of the nitrate market, states a *Times* correspondent writing from Valparaiso.

The Chilian nitrate industry, he says, is controlled by the Asociacion de Productores. At one time both the German and North American interests remained independent, but a few months ago the German producers were induced, both by the Government and also by the extremely favourable terms offered to them, to join the combine. The North American works, however, alleged that they were prohibited by the States Trust laws from joining. The combine now controls 90 per cent. of the total output. Nearly a year ago, during the boom period, the combine fixed the selling price at 17s. per Spanish quintal (the price varied slightly, according to date of delivery), and some half a million tons were sold at these high figures.

Then suddenly the outlook changed, and it was apparent that the large stocks which had accumulated during the war, both in the States and in Europe, were not being got rid of, and that with the continued large production in Chile and the heavy stocks on the coast the outlook was beginning to look serious. However, owing to certain stipulations made with the speculators, the latter were protected from a fall in price during a certain period. After June the combine can vary its price, and it has stated that for 12 months from that period the price will be not less than 14s., yet buyers are not coming forward, and the position is getting daily more serious.

Many works have been closing down, but even so, the production is at present two-thirds of what it is in normal times, and stocks are continually increasing.

The general opinion is that the combine will have to cut their official price considerably in order to work off stocks. The present very low rate of exchange greatly benefits producers, the greater part of whose wages bill is paid in currency, so that it would seem that there is a big margin for reduction. Nitrate works not in the first rank can produce at 10s. 6d. per quintal (those in the front rank very much cheaper). This means, with a price of 14s., a profit of 3s. 6d. per quintal, which in the old days would have appeared Utopian.

The report concludes by stating that although there is no doubt that new fields will be found for the employment of Chilian nitrate, the fact remains at present that the price asked is too high, and that the sooner it is brought down the better for all concerned. As low a price as is compatible with a fair profit, a great increase in propaganda and liberal research expenditure in order to bring down the excessive cost of production should result in very different conditions prevailing in the near future.

Protection for Radium Workers

A PRELIMINARY meeting of the X-ray and Radium Protection Committee has been held at the premises of the Royal Society of Medicine, Wimpole Street. The Committee is composed of radiologists, physicists, pathologists, and others nominated by the electro-therapeutic section of the Royal Society of Medicine, the British Association for the Advancement of Radiology and Physiotherapy, the Institute of Physics, the Rontgen Society, and the National Physical Laboratory, and is under the chairmanship of Sir Humphry Rolleston. The intention of the Committee is to issue very shortly a considered statement as to the urgency of affording adequate protection to the worker, indicating the best means whereby this may be carried out. For this purpose a sub-committee has been appointed.

Synthetic Rubies

In an interview with a prominent dealer in precious stones, a Press representative was informed that in the MANUFACTURE OF SYNTHETIC RUBIES, a small crystal of silicate of alumina coloured by bi-chromate of potash, is rotated at a very high speed and simultaneously kept at a temperature of 1,800°C. by means of an oxy-hydrogen blowpipe. It is then covered with minute particles of natural ruby and a large bead from which rubies can be cut, is built up.

Synthetic Drug Industry

Organic Substances in Medicine

ON Monday the delegation of American and Canadian merchants who are making a tour of this country attended a reception at the Leeds University and were received by Sir Michael and Lady Sadler.

Several lectures were given, and Professor J. B. Cohen, who lectured on "Synthetic Drugs," said the synthetic drug industry, like the colour industry, was captured by Germany, and it was developed partly through the utilisation of by-products from the colour industry. At the beginning of the war we found ourselves without a number of important drugs, but this want of home-made medicines was now rapidly being rectified. Formerly herbs and decoctions of herbs were employed in medicine. Medicine was dependent upon natural products until the nineteenth century, for there were no anæsthetics and no antiseptics.

In 1803 the French chemist Derosne isolated morphine from opium, and, a little later, quinine, from cinchona bark, and other vegetable alkaloids were isolated. This was an important discovery, because it showed that the effect of these natural materials was due to some specific ingredient, and it enabled chemists to discover the composition, and, possibly, the synthesis of these substances. The structure of most of the useful alkaloids, although known, was too complex to be prepared cheaply, but, on the other hand, it had been possible to imitate their composition and produce the same, or sometimes improved, physiological effects more cheaply.

Synthetic drugs were being introduced in the first place for entirely new applications, and, secondly, to improve on the active principles of the natural products at lower cost. Among other synthetic drugs might be mentioned a number of local anæsthetics built up in imitation of the structure of cocaine, and used for small surgical operations, and antipyretics included substances, which having similar properties to quinine had been obtained synthetically. Narcotics and hypnotics had been introduced in place of morphine, and tonics and a variety of other organic compounds were being employed in medicine for special purposes.

Professor Cohen said there is a great future for the application of organic substances to medicine. Many compounds which were discovered long ago had only recently been shown to have useful physiological properties.

Though discovered in the fifth century, ether was never used until three centuries later, and the same was true of other substances.

Alcohol from Jungle Vegetation

MR. H. N. WHITFORD, of the Yale School of Forestry, is responsible for the statement that there need be no scarcity of fuel for motor cars, as it can be obtained from the moist vegetation of tropical jungles, but that the difficulty is to discover a profitable method of manufacture. The evidence is conclusive, he states, that the tropical sun has the power to store up more energy in the form of cellulose in a given time than has the temperate sun. If this is in a utilisable form it remains for the ingenuity of man to overcome the difficulties of profitably applying it. With the increasing needs of the nation it is reasonable to expect that sooner or later it will be necessary to utilise more fully the plant resources of the tropics. Mr. Whitford states that the annual production of alcohol is now nearly 3,000,000 gallons, and that one distillery has produced 93 per cent. alcohol at a cost of about 20 cents a gallon, and if operated to full capacity could make it at a cost of 15 cents a gallon.

The Theory of Relativity

PROFESSOR EINSTEIN will arrive in England early in June, and will be, while here, a guest of Lord Haldane. In the afternoon of June 9 he will deliver a lecture on "The Development and Present Position of the Theory of Relativity" at King's College, at which Lord Haldane will preside. The lecture will be delivered in German, but it is expected that arrangements will be made for an interpreter to be present.

Tickets are obtainable on application to the Principal, King's College. A charge of 2s. 6d. will be made for admission and the proceeds will be given to the Imperial War Relief Fund.

U.S.A. Soda Compounds Trade in 1920

THE New York *Journal of Commerce* of April 11 gives statistics, compiled by the United States Geological Survey of the production, importation and exportation of sodium compounds and metallic sodium in the United States during the year 1920 as compared with 1919. According to those statistics, sales of all sodium compounds during the year, plus those of metallic sodium, increased 8 per cent. in quantity and about 17 per cent. in value. Sales for the year were 9,886,020 short tons, and the total value was $139,336,338. The following table shows the dales of the most important items on the list :—

	Short tons. 1919.	1920.
Sodium acetate	778	1,020
Sodium bicarbonate	134,962	188,906
Sodium bichromate	26,526	25,973
Sodium bisulphite	11,819	22,059
Soda ash	981,054	1,242,490
Sal soda	80,090	62,857
Sodium hydroxide	311,388	382,680
Sodium phosphate	14,760	30,515
Sodium silicate	300,138	304,503
Salt cake	134,685	184,946
Glauber's salt	42,087	44,479
Nitre cake	83,402	308,638
Sodium sulphide	45,448	42,952
Sodium tetraborate	28,518	35,281

Sodium bichromate, ferrocyanide, nitrite, thiosulphate (hyposulphate) and sal soda were the only compounds that showed considerable decreases in 1920. Several of the compounds made good advances over 1919, and sodium bicarbonate, bicarbonate, bisulphite, phosphate and borax made new records.

The sales of the sodium compounds derived directly from natural sources in 1920, exclusive of common salt, also probably made a new record. They amounted to 42,683 tons, valued at $1,513,179, as compared with 29,120 tons, valued at $674,083 in 1919. The sales included under this head are sodium carbonate, sulphate, trona and borax.

Imports Increase

The following list gives the imports of soda compounds in 1920, and the changes from 1919 :—

Product.	Short tons.	Increase 1919. Short tons.
Sodium chlorate	281	262
Sodium cyanide	3,795	1,208
Sodium nitrate	1,480,519	1,024,053
Sodium nitrite	5,845	4,570

The only compounds where imports exceed the domestic production are sodium nitrate. Moreover, the imports of sodium vastly exceed those of any other compound.

Exports

The following table gives the exports of domestic sodium compounds for 1919 and 1920. The table does not include foreign sales re-exported, chiefly sodium nitrate and common salt. The total is believed to be a record. Japan, Canada and Mexico were the leading consumers of these exports.

The following table shows the domestic sodium salts exported from the United States in 1919 and 1920 by classes :—

Product.	Short tons. 1919.	1920.
Soda ash	50,481	8,338
Sal soda	5,553	6,015
Caustic soda	82,118	112,069
Sodium silicate	12,150	17,048

The article concludes with the information that the prices obtained for sodium compounds in 1920 were generally better than those in 1919, although towards the end of the year the prices of most of the salts fell to about the levels they reached at the beginning of the year. Jobbers' prices appeared to be an accurate index of the consumers' demands. Sodium sulphate was in especial demand in 1920 on account of foreign bids, and it closed the year at a slightly higher price than in the previous year. The price of sodium bichromate was at one time higher than it was during the war, but fell abruptly later in the year. Considered broadly, the prices of the various items that make up the costs of manufacture of sodium compounds now appear to be practically down to pre-war levels.

The Manufacture of Steel

A French Chemist's Claims

A FRENCH chemist named Basset has, according to an account in the *Matin*, invented a new process for the manufacture of steel. The inventor, it is stated, claims to have reduced the process of steel-making by one step and to have discovered a means of turning iron ore direct into steel without any intermediate process of purification and incidentally dispensing with the use of coke; a saving of one-sixth in the time of manufacture is also claimed.

According to the non-technical account given in the *Matin*, the roasting or calcination of the ore remains the same, but the method of operating the blast is changed. At present the round or charge is prepared in the proportion, say, of six of ironstone, six of coke, and three of limestone. Coke must be used by the ordinary process "because it alone does not become crushed in the furnace and allows the circulation of air and gases necessary to the operation." M. Basset says he realises this melting operation by the use of coal-dust. "This is done in an enclosure at a very high temperature by blowing coal-dust and air, heated to between 700 and 1,000 degrees." This coal-dust is "dosed" so as only to produce carbon dioxide while burning in this super-heated air. The heating of the air to the requisite degree is done by a modification of the ordinary method of "the stove."

"By the Siemens process the atmosphere in which the reduction of the ore takes place is charged with carbonic acid gas, which re-oxidifies part of the molten iron. This undesirable feature is obviated by the new blast."

Finsbury Technical College

THE Governing Body of the Finsbury Technical College announce that the entrance examination for the Session 1921-22 will be held on Tuesday, September 20 next. Applications for admission should be forwarded to the College not later than September 15 on forms to be obtained from the Registrar, Leonard Street, City Road, E.C. The programme of the College is under revision and will be issued in due course.

In connexion with the recently-formed Manchester Section of the Finsbury Technical College Old Students' Association a smoker was held at the Grand Hotel on April 29. The members present were treated to an excellent programme and altogether a most enjoyable evening was spent. Although the membership is gradually increasing, it is felt that it should do so much more rapidly, and to this end any old students desirous of joining the Section are asked to write to the Local Honorary Secretary, Mr. H. F. Coucher, 9, Cartwright Road, Chorlton-cum-Hardy, or to Mr. Eustace Thomas.

Extraction of Oil from Sicilian Asphalt

AN Italian company engaged in the production of schist oil on a large scale and possessing one of the richest of the asphalt deposits of Sicily is reported to have developed a process for obtaining mineral oil with an extremely low bituminous content. According to a recent description of the process, the low fuel value of the product is overcome by recovering almost completely the latent heat of the ash by means of a current of the inert gases from the condenser discharges. The oil particles which the combustion fumes carry in suspension are recovered by means of centrifugal filters and condensers. In this way an oil is obtained which may be used as a fuel, having as much as 10,300 calories per kilog. The company, it is stated, is planning the construction of a large oil refinery near Rome. The 1920 production of mineral oil is estimated to be 5,000 metric tons, and it is expected that this will be increased to 10,000 metric tons during the present year.

The United States Corn Products Refining Co. is reported in the American Press to have concluded negotiations for the taking over of plants in England, Germany and France, after negotiations extending over several months. The company which has a capital of $80,000,000, intends to manufacture and distribute its goods in Europe. The German plants are to be located at Hallem, Steutz, Grafenhainichen and Nierstein.

The Sharples Super-Centrifuge

WE are informed that the usefulness of a Sharples Super-Centrifuge as a part of the ordinary equipment of a works laboratory has been signally demonstrated in some recent instances in which results obtained with the laboratory super-centrifuge have shown the practicability of valuable recovery processes on the large scale, which have resulted in considerable monetary savings. In one case a well-known firm had been working for years on the purification of a product, but were apparently unable to get any further. This firm recently installed a laboratory Sharples Super-Centrifuge, and on treating the product in this apparatus with certain reagents a practically perfect result was immediately obtained. The process is now being installed on a large scale and a considerable annual saving is anticipated.

The Sharples machine is, of course, well known in connexion with such processes as the recovery of vegetable oil from soap stock, the dehydration of water gas tar, the recovery of crude oil from bottom settlings, the clarification of essential oils, &c. Many installations have been put to work during the past twelve months, and the list of applications is steadily growing.

German Chemical Profits

WRITING from Berlin, a correspondent of the *Financial News* states that the substantial dividends in Germany continue to reflect the present activity in trade there. The Bayer Dye Works, of Leverkusen, are paying a dividend of 12 per cent. upon a capital which has been doubled, from 90 to 180 millions. The Uerdingen Chemical Factory pays 15 per cent.; the Ruebeland Harzer Works, 25 per cent.; the Lingner Works, Dresden, 15 per cent.; and the Chemical Works of Theodor Teichgraeber, Berlin, 14 per cent.

Demand for Dyes in China

ACCORDING to a United States Commerce Report there is a fair demand for foreign dyes in the Tsinau district of China. As one of the districts largely in the hands of the German merchants before the war, Shantung depended almost entirely upon German dyes, and such dyes are still to be found on the market. European and American, as well as Japanese dyes, are now sold on the Shantung market.

British dyes, states the report, have been particularly prominent, the goods offered being principally from one source and of standard and uniform grade. It has been stated that these dyes cannot be obtained in sufficient quantities to meet the rowing demand.

Future of Patent Fuel

WITH a view to re-organising the concern in order to meet the situation caused by the trade slump, Sir Arthur Whinney has been appointed liquidator of the Sun Fuel Co., Ltd., Swansea. The firm commenced the manufacture of ovoids at the North Dock, Swansea, about three years ago, and when the boom in patent fuel was at its height some eighteen months ago it acquired the Nos. 1 and 2 Atlantic Patent Fuel Works on either side of the same dock, the capital being increased to £500,000 for the purpose. It is believed that once the coal dispute is settled the patent fuel industry will quickly regain its former prosperity.

Ramsay Memorial Fellowship

THE Ramsay Memorial Trustees will, at the end of June, consider applications for two Ramsay Memorial Fellowships for Chemical Research. One of the Fellowships will be limited to candidates educated in Glasgow. The value of the Fellowships will be £250 per annum, to which may be added a grant for expenses not exceeding £50 per annum. Full particulars as to the conditions of the award are obtainable from Dr. Walter W. Seton, secretary, Ramsay Memorial Fellowships Trust, University College, London, W.C.1.

Reduction of Reparation Duty

THE Treasury announce that in respect of goods imported on and after May 13, 1921, the proportion of the value of German goods to be paid to the Commissioners of Customs and Excise nder the GERMAN REPARATION (RECOVERY) ACT, 1921, will e reduced from 50 per cent. to 26 per cent.

Mr. Ernest Benn's American Tour

MR. ERNEST J. P. BENN, managing director of Benn Brothers, Ltd., publishers of THE CHEMICAL AGE, who is making a tour of the principal industrial centres in the United States of America for the purpose of studying industrial conditions there, was on May 5 entertained at the Engineers' Club, New York, at a luncheon given in his honour by the Association of Business Papers, Inc. Mr. James H. McGraw, president of the McGraw-Hill Co., Inc., publishers of *Chemical and Metallurgical Engineering* and other technical journals, presided over a large and representative gathering of technical publishers. The representatives of American trade and technical journals who visited Europe at the close of the war took advantage of this occasion to express to Mr. Benn the lasting appreciation of the many courtesies which he extended to them during their stay in the United Kingdom.

Phosphate Production of Curacao

ACCORDING to a recent report, the position of the phosphate mines in Curacao is favourable, notwithstanding the fact that a number of miners (1,166 during November and December last) migrated to Cuba. During 1920, 64,969,200 kilogrammes of phosphate of lime obtained from the Curacao mines were exported to the following countries :—Sweden, 28,504,960kg.; the Netherlands, 10,566,400 kg.; Norway, 508,000 kg.; Spain, 2,946,400 kg.; England, 2,113,280 kg., and Germany, 15,758,160 kg.

During the years 1915-1919 the following quantities were exported :—1915, 31,308,000 kg.; 1916, 14,468,000 kg.; 1917, 3,582,000 kg.; 1918, nil; 1919, 10,052,000 kg.

Coal Priority List

IT is announced in the "Board of Trade Journal" that the Government have arranged to import coal to meet the essential needs of the country. Arrangements have been made through four firms who are acting as Government agents, and who have been given instructions that they are to dispose of the coal according to a priority list. There are four degrees of priority, railways being in the first; gas works are included in the second portion of the list, while in the fourth division are yeast producers, crushing factories producing edible oils, and salt factories producing fine salt or rough salt for cold storage.. No mention is made of chemical works.

Committee on Trusts

THE Standing Committee on Trusts at its final meeting on May 18th, passed a resolution "placing on record its conviction that the work of the Committee has been prematurely cut short, and that, from the point of view of the public interest, it is both urgent and important that the work of inquiry into the formation and operation of trusts and combines should not be permitted to lapse."

Fats and Oils for Soaps

CHARLES TENNANT & CO., LTD., of 93, West George Street, Glasgow, whose activities in connexion with the manufacture of soaps are well known to our readers, inform us that they have large stocks of caustic soda and refined alkali for the manufacture of hard soap, and of caustic potash and carbonate of potash for soft soap. These chemicals are, of course, supplementary to oils and fats of all kinds, the supply of which is a speciality of the firm.

They also hold considerable stocks of all grades of waxes used in candle making and are dealers in glycerine.

THE Ayrshire Chemical Co. have commenced business at West End Works, Dalry, N.B., as paint and varnish manufacturers, lead grinders and tar and oil refiners. They inform us that they have installed an up-to-date plant for the manufacture of paint, enamels, varnish, putty, and the grinding of lead. Their oil-refining plant is completed and orders are now being executed.

Chemical Matters in Parliament

Excess Profits Duty

MR. REMER (House of Commons, May 24) asked the Chancellor of the Exchequer whether he was aware of the complaints which had been made by business firms of the delay in repayments of Excess Profits Tax; and whether, in the circumstances, he would take steps to have these payments expedited?

Mr. Young said he was not aware of the complaints referred to, but he would cause inquiry to be made into any case in which it was alleged that undue delay had occurred. Applications for repayment of Excess Profits Duty were dealt with as expeditiously as possible, but it would be appreciated that such applications often involved very substantial sums and that repayment could not properly be made until the necessary evidence in support of a claim was furnished and examined.

Safeguarding of Industries

Mr. Lyle-Samuel (House of Commons, May 24) asked the President of the Board of Trade whether the Board had drawn out a list of the articles to which the Second Resolution for the Safeguarding of Industries would apply under paragraphs (a) and (b), respectively; and, if so, whether he would issue this list before the Report stage of the Resolution was taken. Replying, Sir P. Lloyd-Greame said the Board of Trade had not drawn out a list; as was stated during the Debate on these Resolutions, it would be for the Committees to be set up under the Safeguarding of Industries Bill to advise to what articles the provisions of this Resolution should be applied.

In reply to a further question by Mr. Lyle-Samuel, Mr. Chamberlain said it was the intention of the Government to proceed with the Safeguarding of Industries Resolutions, and to introduce and pass a Bill founded upon them.

In answering subsequent questions by Mr. White, Mr. Chamberlain said the Safeguarding of Industries Bill could not be introduced until the Resolutions were reported to and passed by the House.

Oil Boring Operations

Major Kelly (House of Commons, May 24) asked the Prime Minister whether boring for oil was still continuing in Great Britain under a Government subsidy; if so, with what result; and when would the subsidy terminate?

Sir R. Horne said boring for oil was being carried out in this country by S. Pearson & Sons, Ltd., as agents for the Government under an agreement between the firm and the Minister of Munitions. Eight boreholes had been completed, of which one was producing oil in commercial quantities and the remaining seven were being closed down. Three other borings were still in progress. The date of the termination of the agreement must largely depend upon a settlement of the question of the ownership of the petroleum discovered, in respect of which legal proceedings were now pending. In the meantime, he said, expenditure was being reduced.

German Reparation (Recovery) Act

Mr. Kiley (House of Commons, May 24) asked the Prime Minister the amount which had now been collected under the German Reparation (Recovery) Act; whether German exporters had refused to accept half of the price in full payment for their goods; whether, in practice, the whole price had been paid, and the Customs had demanded its equivalent payment of the 50 per cent. under the Act; and whether the payment was equivalent to 100 per cent. duty, and was paid by the British importer.

Sir R. Horne said the amount received by the Commissioners of Customs and Excise under the German Reparation (Recovery) Act up to the 21st instant inclusive was £19,000. He understood that in some cases British importers had paid the German exporters the full invoice price of the goods. As to the amount payable to the Commissioners in such a case, he would refer the hon. Member to the reply given by the Financial Secretary to the Treasury to Mr. Jameson on the 9th instant. (*See* THE CHEMICAL AGE, May 14, p. 563.)

In reply to questions by Mr. Hogge and Colonel Wedgwood, Mr. Chamberlain said he was not aware that any of the £10,000 was being reclaimed and that none of this money was being presented to the French Government.

Mr. Kiley then asked whether, under the new reparation proposals accepted by Germany, the payment of 25 per cent. in respect of German exports would be demanded in respect of goods upon which payments of 50 per cent. were made under the German Reparation (Recovery) Act and similar legislation in other countries; and, if not, whether he could state how the discrimination between the different classes of goods would be made.

Mr. Chamberlain in reply referred the inquirer to the schedule of payments prescribed by the Reparation Commission and accepted by the German Government; this would show that the levy of 25 per cent. provided for in paragraph 7 (*b*) was not to be applied upon exports on which a levy of not less than 25 per cent. was applied under legislation of the character of the German Reparation (Recovery) Act. It would be for the German Government to make their own arrangements to exempt such exports from the levy to be made by them in Germany.

Captain Wedgwood Benn asked whether the 26 per cent. to be collected under the German Reparation (Recovery) Act would be levied as an ordinary Customs duty or in the same way as the 50 per cent. had hitherto been collected.

Mr. Chamberlain said the 26 per cent. to be collected under the German Reparation (Recovery) Act would be levied in the same way as the 50 per cent. had hitherto been collected; but the German Government had now undertaken to repay the amount so collected to the exporter.

Use of Fertilisers in Ceylon

THE recently issued Report on the trade of Ceylon in 1919 states that the imports of all kinds of fertilisers amounted to 1,552,192 cwt., an increase of 244,516 cwt. over 1918. The largest importation under this head was ground-nut manure (401,836 cwt.), exclusively from British India, which was also the largest supplier of fish manure and fish guano, with 267,261 cwt. and 219,262 cwt., respectively.

The following are the principal sources of supply:—British India, bone manure, 249,896 cwt.; British India, castor seed poonac, 84,446 cwt.; British India, refuse of saltpetre, 52,597 cwt.; British India, other manure, 45,991 cwt.; France, basic slag, 23,960 cwt.; Egypt, basic slag, 29,987 cwt.; British India, bone meal, 21,083 cwt.; Natal, sulphate of ammonia, 11,185 cwt.; Norway, other manure, 11,098 cwt.; Chile, nitrate of soda, 10,000 cwt.; Belgium, sulphate of potash, 6,380 cwt.

Quebec Asbestos Industry

THE Government of Quebec is reported to be contemplating an important development of the asbestos industry in Quebec, so as to give employment in the same manner that the great paper and pulp business has been developed. About 85 per cent. of the asbestos supply of the world is in Quebec. The Government is considering whether asbestos can be worked to a certain state of manufacture, if not altogether. The situation is largely parallel with the wood position. Wood cut on Crown lands cannot be exported except as pulp or paper, and the asbestos comes from Crown property, the mines not being sold outright, but mineral rights given. The development of an industrial manufacturing business in asbestos would, it is calculated, create a great and new industry in the province. For the year ended June 30, 1920, the production was 174,421 tons, with a value of $41,758,234.

Recent Wills

Mr. E. L. Hitchcock, of Banbury Road, Oxford, chemist	£17,800
Mr. H. B. Ransom, M.Inst.C.E., of Upper Norwood	£11,614
Mr. E. A. Hengston, of Eastfield, Flax Bourton, Somerset, a director of Norrington, Hingston & Co., Ltd., chemical manure manufacturers	£26,920
Mr. T. Mayor, of Sheffield, chemist	£3,550
Mr. W. Hannaford, of Watford, chemist	£2,479
Mr. A. W. Miller, of Lily Bank Terrace, Hillhead, Glasgow, and of James Miller, Son & Co., West Nile Street, Glasgow, drysalters, gas and mineral oil products manufacturers	£93,751
Mr. H. B. Jowett, of St. Andrew's Place, Bradford, dyer, managing director of Fieldhouse & Jowett, Ltd., Bradford	£14,300

From Week to Week

JOHNSON, MATTHEY & CO., LTD., have sent a donation of £10 10s. to the Royal Surgical Aid Society.

During 1920 the United Kingdom exported 356,735 lb. of CARBONATE OF POTASH to the United States of America.

SIR CECIL PARTRIDGE, K.B.E., has resigned his position as chairman and director of the South African Carbide and By-Products Co., Ltd.

On June 17, at the Royal Institution, Sir J. J. THOMSON will deliver a lecture on "Chemical Combination and the Structure of the Molecule."

Messrs. M. B. CAMERON & CO., chemical merchants and exporters of Glasgow, have been elected members of the Glasgow Chamber of Commerce.

On Friday evening at the University College, London, SIR WILLIAM TILDEN delivered the first of three public lectures on "TheHistory of Chemistry in the 19th Century."

PLATINUM VESSELS used for chemical analysis and other apparatus, worth altogether £3,000, were stolen from the laboratory of the Prefecture of Police in Paris last Sunday night.

With the exception of a consignment from Port Talbot to Buenos Ayres consisting of 3,500 tons, there were NO EXPORTS OF PATENT FUEL from South Wales ports last week.

The U.S.A. Department of Commerce is contemplating surveys of conditions in the zinc markets of the world with a view to discovering the most profitable outlets for the disposal of surplus American zinc.

During the period January-October, 1920, CAUSTIC SODA was imported into Brazil to the extent of 9,989,968 kilogs, valued at £345,340. The amounts for the whole of the previous year were 9,892,082 kilogs, valued at £383,410.

Large stocks of DYESTUFFS, consisting of alizarine, aniline and synthetic indigo, are reported to have accumulated in Japan. Local dyemakers have offered protests against the continued importation of German dyes.

It is reported that the South African Iron & Steel Corporation, Ltd., have decided to instal NEW PLANT which will include coke ovens with up-to-date equipment for the recovery of tar, sulphate of ammonia and benzole.

The discovery of a substitute for bone black, or bone char, the standard material used in decolourising and refining sugar and various liquids, syrups and oils, is announced by the Atlas Powder Co., of Wilmington, Del.

The foreign delegates which are coming to this country to take part in the INTERNATIONAL RUBBER EXHIBITION will be entertained by Lord Leverhulme on June 5 at "The Hill," North End Road, Hampstead.

The Department of Mines of South Australia has issued Bulletin No. 8 of the Geological Survey, "THE SALT AND GYPSUM RESOURCES OF SOUTH AUSTRALIA," by Mr. R. L. Jack, the Deputy Government Geologist.

On the motion of the Vice-Chancellor of the University of Oxford, thanks have been passed to Barclays Bank, Ltd., for their DONATION OF £1,000 towards the completion of the Dyson Perrin's Laboratory of Inorganic Chemistry.

The presentation to Madame Curie of the GRAMME OF RADIUM, which is a present from the women of the United States, took place at the White House ,Washington, on May 20 in the presence of President and Mrs. Harding, Madame Jusserand (the wife of the French Ambassador), and Princess Lubomirski.

A PUBLIC MEETING on "The Administration of Scientific Work" will be held in the Botanical Theatre, University College, Gower Street, W.C.1, on Monday, May 30, at 8 p.m., under the auspices of the National Union of Scientific Workers. The chair will be taken by Viscount Haldane, and the speaker will be Professor L. Bairstow.

Mr. Henry Mayer, the chairman of Henry Mayer & Co., Ltd., has bequeathed to the Pottery & Glass Trades' Benevolent Institution the sum of £500 to be used as an endowment in perpetuity, and the income applied towards providing an annuity or annuities for the widow or widows of members. The endowment will be known as "THE HENRY MAYER BEQUEST."

Mr. James E. Dawson, of the Ammonia Works, Worsley Road, Farnworth, near Bolton, announces that he has removed his business to much larger and more convenient premises at Preston. His address is now Dock Tar & Ammonia Works, Ashton Marsh, Preston, to which it is requested that all empties and correspondence shall be sent.

The death has occurred at Woking of Mr. PERCIVAL D. HOLLINGS, a chemist who rendered valuable services to the Government during the war, especially in connexion with improved aircraft devices. He went to Russia in 1913 to organise the works of Leitner's Electrical Company at Moscow, and in 1915 was appointed superintendent of train-lighting on the Great Western Railway. He was in his 36th year.

The Salters' Institute of Industrial Chemistry, Salters Hall, St. Swithin's Lane, E.C. 4, invites APPLICATIONS FOR A LIMITED NUMBER OF FELLOWSHIPS, value £250 per annum, from those who by October next will have completed three years' training in chemistry and seek an industrial career. Full particulars of training and war service, if any, of candidates should reach the director of the Institute before June 18.

We are informed that by arrangement with United Water Softeners, Ltd., Mr. J. J. Lassen has taken over the meter department of that company, and has formed it into a separate concern under the style of the Lassen Meter & Engineering Co., Holders Hill House, Hendon, London, N.W. 4. The latter company is specialising in the manufacture of the Rheograph Water Flow Recorder and Lassen Patent Tipper Meter for use in connexion with boiler installations.

The average output of SALT IN MAURITIUS is 1,800 tons per annum and the supply is mostly drawn from the district of Black River which affords facilities for the easy and cheap manufacture of good salt, being one of the drier districts of the island. By more extensive use of machinery for water lifting and mechanical appliances for transport and storage, the existing salt pans should be able to yield all the salt required for local consumption. The annual consumption is estimated at 3,000 tons, the bulk of which is imported from Aden and Liverpool.

The report on the Administration of Mysore for the year ended June 30 last states that a sum of Rs.3,000 was sanctioned by Government in connexion with the MANUFACTURE OF SODIUM CARBONATE. Further tests were continued with the deposits of alkaline earth near Mandya, in order to ascertain the cause of poor results obtained last year, and it was found to be due to seasonal causes. Experimental work was also carried on with soda earth occurring near Nejanti and Tadakalur, in the Sira taluk. The quantity of soda earth collected and treated in these areas was 230 tons, and the soda obtained about 19 tons.

Mr. E. C. D. Rawlins, Commerical Secretary to H.M. Legation at Athens, has arrived in this country on a short official visit. He will be pleased to meet manufacturers and merchants who wish to discuss with him questions relating to TRADE WITH GREECE, and who may desire information or advice regarding the appointment of agents, marketing and distributing goods, terms of payment, or general information as to openings existing for British goods. Applications to interview Mr. Rawlins in London up to June 3 should be made to the Department of Overseas Trade, 35, Old Queen Street, S.W.1, the reference number 3057 T.G. being quoted. It is intended that Mr. Rawlins shall subsequently visit a number of provincial centres.

Previous theories on the FORMATION OF BENZENE in gas retorts and coke ovens are shown to be untenable by F. Fischer and H. Schrader in *Brennstoff-Chem.* It is demonstrated experimentally that phenols when heated with hydrogen yield benzene, $C_6H_4(CH^3)OH+H_2=C_6H_5.CH_3+H_2O$, and $C_6H_5.CH_3+H_2=C_6H_6+CH_4$, and this reaction may be of importance in the manufacture of benzene from tar. With iron tubes only poor yields of benzene were obtained and much carbon separated, but with tinned iron tubes, at 750°C., good yields (up to 78 per cent.) were obtained from phenols and from toluene and higher benzene homologues. Hexane yielded very little benzene, but high yields were obtained from diphenyl, aniline, diphenylmerhane, and diphenylamine.

References to Current Literature

British

SACCHARIN. Some methods of purification of *o*-toluene=sulphonamide. P. V. McKie. *J.S.C.I.*, May 16, 1921, pp. 92-94T.

ESSENTIAL OILS. The volatile oil from the leaves of the "wild pimento" of Jamaica. O. D. Roberts. *J.S.C.I.*, May 16, 1921, pp. 94-96T.

ANALYSIS. Apparatus for the routine determination of melting points of fats and fatty acids. S. H. Blichfeldt and T. Thornley. *Analyst*, May, 1921, pp. 180-182.

The detection of adulteration in butter by means of the melting point of the insoluble volatile acids. G. V. B. Gilmour. *Analyst*, May, 1921, pp. 183-187.

The estimation of strychnine in scale preparations containing quinine and other cinchona alkaloids. T. F. Harvey and S. Back. *Analyst*, May, 1921, pp. 188-193.

A colour reaction for aconite. S. Mallanneth. *Analyst*, May, 1921, pp. 193-194.

A method for the determination of the acidity of coloured solutions. J. L. Lizins. *Analyst*, May, 1921, pp. 194-195.

The analysis of white metals. C. C. Bissett. *Metal Ind.*, May 20, 1921, pp. 381-382.

TANNING. Recent developments in methods of tanning. U. J. Thuau. Mineral tannages; vegetable tannages; tanning with synthetic tanning agents. *J. Soc. Leather Trades' Chemists*, March, 1921, pp. 70-84.

Some notes on the filtration of tanning solutions. J. G. Parker and J. T. Terrell. *J. Soc. Leather Trades' Chemists*, April, 1921, pp. 112-115.

Action of sodium carbonate on chrome alum solutions. L. Meunier. *J. Soc. Leather Trades' Chemists*, April, 1921, pp. 103-111.

FRIEDEL-CRAFTS' REACTION. The Friedel-Crafts' reaction. Part II. Migration of halogen atoms in the benzene nucleus M. Copisarow. *Chem. Soc. Trans.*, April, 1921, pp. 442-447.

METALLURGY. The casting of metals. T. Turner. *Metal Ind.*, Part I., May 13, 1921, pp.366-371; Part II., May 20, 1921, pp. 383-388.

GENERAL. The present position of chemistry and chemists. Part III. N. T. M. Wilsmore. *Chem. News*, May 20, 1921, pp. 232-234.

PHYSICAL CHEMISTRY. On the structure of the molecule and chemical combination. J. J. Thomson. *Phil. Mag.*, March, 1921, pp. 510-544.

On the vapour pressures of mixtures. A. W. Porter. *Trans. Faraday Soc.*, February, 1921, pp. 336-345.

Sorption of iodine by carbon. J. B. Firth. *Trans. Faraday Soc.*, February, 1921, pp. 434-452.

British Dominions

FERTILISERS. Manufacture of phosphorus products in Canada. H. S. Spence. Historical sketch of the industry; fertiliser works; phosphorus works; basic slag. *Canad. Chem. and Met.*, May, 1921, pp. 128-132.

HYDRO-EXTRACTORS. Centrifugal extractors and separators applied to the chemical industry. J. F. Broadbent. *Canad. Chem. and Met.*, May, 1921, pp. 135-140.

PAPER. The chemical engineer and the groundwood division of the newsprint industry. R. W. McKenzie. *Canad. Chem. and Met.*, May, 1921, pp. 133-134.

United States

METALLURGY. The crystalline structure of metals. Z. Jeffries and R. S. Archer. Discussion of the methods used in X-ray analysis of atomic spacing. *Chem. and Met. Eng.*, May 4, 1921, pp. 771-779.

Constitution of chromium: tungsten steels. Recent work of Honda, Murakami and others. *Chem. and Met. Eng.*, May 4, 1921, pp. 791-793.

FOODSTUFFS. Present status of fruit and vegetable dehydration. W. V. Cruess. Operation and construction of dehydrating plants; advantages of dehydration; data. *Chem. and Met. Eng.*, May 4, 1921, pp. 781-785.

SULPHURIC ACID. Water-cooled acid chambers adopted in England. A. M. Fairlie. Description of the Mills-Pickard plant. *Chem. and Met. Eng.*, May 4, 1921, pp. 786-789.

TANNING. Iron tannage. Part IV. D. D. Jackson and T. P. Hou. *J. Amer. Leather Chem. Assoc.*, May, 1921, pp. 229-259.

Leather nomenclature. J. H. Yocum and T. A. Faust. *J. Amer. Leather Chem. Assoc.*, May, 1921, pp. 259-264.

The determination in leather of matter extractable by water. J. A. Wilson. *J. Amer. Leather Chem. Assoc.*, May, 1921, pp. 264-280.

The colour measurement of vegetable tanning solutions. T. Blackadder. *J. Amer. Leather Chem. Assoc.*, May, 1921, pp. 280-283.

BLEACHING. Bleaching of coloured cotton goods. J. M. Matthews. *Color Td. J.*, May, 1921, pp. 157-161.

DYEING. Dyeing in the Catik style. B. D. Puyster. *Color Td. J.*, Part I., April, 1921, pp. 128-131; Part II., May, 1921, pp. 162-166.

The degumming of silk. E. Cagliostro. *Color Td. J.*, Part I., April, 1921, pp. 138-141; Part II., May, 1921, pp. 171-174.

Key index for dyestuffs intermediates. Part I. W. N. Watson and A. R. Willis. *Color Td. J.*, May, 1921, pp. 189-193.

WATERPROOFING. The water proofing of cotton fabrics. A. J. Hall. *Textile Col.*, May, 1921, pp. 325-327.

French

TERPENES. The hemiterpenes. Part I. A. Dubose. *Rev. des Prod. Chim.*, May 15, 1921, pp. 273-276.

VALENCY. The strength of the atomic unions in organic molecules. J. Martinet. *Rev. gén. des Sciences*, April 30, 1921, pp. 239-243.

HYDROGENATION. The catalytic hydrogenation of phenyl hydrazones. A. Mailhe. *Compt. rend.*, May 2, 1921, pp. 1107-1110.

TELLURIUM. The tetra-iodide of tellurium. A. Damiens. *Compt. rend.*, May 2, 1921, pp. 1105-1107.

METALLURGY. Industrial chromium alloys. J. Hebert. *La Technique Moderne*, May, 1921, pp. 197-205.

German

PHYSICAL CHEMISTRY. Ammonia-carbonic acid compounds in equilibrium with their aqueous solutions. E. Terres and H. Weiser. *Z. Elektrochem.*, May 1, 1921, pp. 177-193.

ELECTRO-CHEMISTRY. The sodium-oxygen cell. E. Bauer. *Z. Elektrochem.*, May 1, 1921, pp. 194-199.

High-temperature fuel cells. E. Bauer, W. D. Treadwell, and G. Trümpler. *Z. Elektrochem.*, May 1, 1921, pp. 199-208.

NITROCELLULOSE. The viscosity of nitrocelluloses. E. C. Worden and L. Rutstein. *Kunststoffe*, February 2, 1921, pp. 25-28.

FATTY ACIDS. The autoxidation products of unsaturated fatty acids. W. Fahrion. *Chem. Umschau*, Part I., January (I.), 1921, pp. 5-7; Part II., January (II.), 1921, pp. 20-21.

Miscellaneous

AMMONIUM SALTS. The theory of ammonium salts and co-ordination compounds in organic chemistry. J. Piccard and J. H. Dardel. *Helv. Chem. Acta*, May 2, 1921, pp. 406-417.

NAPHTHALENE. The exhaustive sulphonation of naphthalene. H. E. Fierz and F. Schmid. *Helv. Chim. Acta*, May 2, 1921, pp. 381-387.

NITRO-PHENETOL. The preparation of nitrophenetol from nitrochlorbenzene. A. V. Blom. *Helv. Chim. Acta*; May 2, 1921, pp. 297-318.

ELECTRO-CHEMISTRY. The electrolysis of water. E. Bauer. *Helv. Chim. Acta*, May 2, 1921, pp. 325-333.

POLYSACCHARIDES. Polysaccharides. Part VII. The constitution of celloboise. P. Karrer and F. Widmer. *Helv. Chim. Acta*, May 2, 1921, pp. 295-297.

Patent Literature

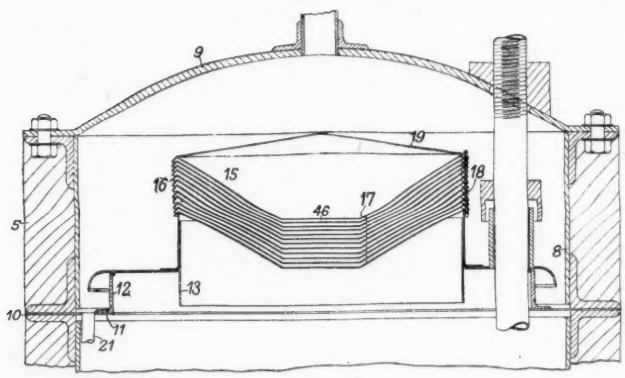
Abstracts of Complete Specifications

161,993. FILTERS. J. Miller, 18, Buller Street, Derby, and George Fletcher & Co., Ltd., Masson & Atlas Works, Litchurch, Derby. Application date, May 5, 1919.

A filter more particularly intended for the treatment of sugar liquor comprises a receptacle mounted on horizontal hollow trunnions through which the liquor is supplied and discharged. The cover is movable over a vertical screwed spindle which passes through a fixed bridge member and is operated by a handwheel on the upper side to move downwards a follower on to the filtering material to compress it. A pipe is provided to draw off any liquor above the filtering medium before opening up the filter, and a stop cock at the bottom of the receptacle to remove sediment. Reference is directed in pursuance of Section 7, Sub-section 4, of the Patents and Designs Acts, 1907 and 1919, to Specification 23,585 of 1895.

162,000. STILLS. A. Philip, St. Vincent, Barfield, Ryde, Isle of Wight. Application dates, September 15, 1919, and January 29, 1920.

The object is to prevent the contamination of a distillate by traces of undistilled liquid which may be carried over by ebullition or frothing of the liquid. The still is heated by an oil jacket and surrounded by lagging 5. An existing still may be extended by a section 8 between the cover 9 and flange 10, and the liquid separator is carried by an annular plate 11. The separator comprises a cylindrical plate 13 carrying a number of truncated conical plates 15, 16, separated by about one-fifth of an inch. Short lengths of tube 17 are interposed between the plates, and each plate is threaded over bolts 18. A plate 19 covers the separator. The annular



162,000

plate 11 and ring 12 form a collecting channel for any liquid which may be deposited on the upper surface of the separator or on the walls of the surrounding chamber, and this liquid is discharged through a pipe 21. The plates 15 have a central opening 46 through which vapour passes to the separator, and the total area of passages provided in the separator is such that the speed of the vapour is slow, so that any liquid particles are deposited. A modification is described as applied to a wagon still, in which a number of separator units are arranged above a transverse partition across the upper part of the still. In another modification, the vapour passes through the separator radially inwards instead of outwards, and in other modifications the separator may consist of radial plates or a metal strip rolled into a spiral.

162,026. ARGENTIFEROUS LEAD-ZINC SULPHIDE ORES. F. E. Elmore, Three Fields, Boxmoor, Herts. Application date, December 18, 1919.

The ore is finely ground and mixed with sodium, potassium, calcium, or magnesium chloride, either by mixing the materials dry or by adding the chloride in solution and drying the mixture. The mixture is heated in air to about 450-500°C., at which temperature the lead sulphide is completely oxidised, but the zinc sulphide is substantially unaffected. The product is treated with a hot saturated solution of sodium chloride which extracts the lead salts, part of the silver, and any soluble zinc salts. The solution is cooled, and the deposited lead salts are treated for the recovery of argentiferous lead sulphate. If the undissolved zinc sulphide contains less than 1 per cent. of lead, it may then be treated with a solvent for silver such as a 35 per cent. solution of calcium chloride containing 3-5 per cent. of cupric chloride or 3 per cent. of hydrochloric acid. If the zinc sulphide contains a larger proportion of lead, it is treated with hot, strong brine containing sulphuric or hydrochloric acid to extract the lead and part of the silver, and the lead and silver are recovered by known methods. In a modification, if there is any unoxidised lead sulphide in the ore after heating, the material is leached with a hot, strong solution of calcium or magnesium chloride and hydrochloric acid which extracts the silver. The separate treatment with hot, strong brine and sulphuric acid is avoided.

162,030. ZINC SOLUTIONS, PURIFICATION OF. S. Field, Northampton Polytechnic Institute, St. John's Street, London, E.C.1, and The Metals Extraction Corporation, Ltd., Finsbury House, Blomfield Street, London, E.C.2. Application date, December 19, 1919.

Zinc sulphate solution is purified from other metals by treating it with a metal or alloy more electro-positive than the metals to be removed, in the presence of a mercury salt. The metal used may be zinc or aluminium, or a zinc-aluminium alloy, *e.g.*, zinc fume or blue powder. The mercury salt used may be the chloride or nitrate, but if the zinc salt is to be subjected to electrolysis, the mercury salt must be selected so that it does not attack the anodes, *e.g.*, mercuric sulphate may be used. When the zinc powder and mercury salt are added, mercury is deposited on the zinc and an electric couple is formed, on which impurities such as copper, arsenic antimony, bismuth, cadmium, nickel, cobalt, &c., are deposited, The mercury may be recovered from the sludge by distillation.

162,038. POWDERED METALS AND SUB-OXIDES, PRODUCTION OF. C. Ellis, 92, Greenwood Avenue, Montclair, N.J., U.S.A. Application date, January 14, 1920.

The object is to obtain a finely divided metal such as nickel for use as a catalyst in the hydrogenation of fatty oils. A compound of the metal which is stable under heat, or is converted into the oxide, is mixed with an oily or waxy substance such as paraffin wax, petroleum jelly, mineral oil, or its heavier distillates, and heated to such a temperature that the hydro-carbon is partly cracked. Suitable metal compounds are the carbonate, hydroxide, oxide, nitrate or oxalate of nickel, copper, or cobalt, and the heating to effect cracking may be carried out to 300-400°C., preferably between 340 and 370°C. The reduction of the metal compound is effected by the products of cracking of the hydrocarbon and the powdered metal is suspended in the medium, in which it may be kept for a long period without loss of catalytic efficiency. The catalyst may be concentrated by treating it in a centrifugal apparatus to remove the excess of hydrocarbon. The medium preferred is paraffin wax, and the process of preparing the catalyst is described in detail.

162,117. DECOLOURISING CHARCOAL, PROCESS FOR THE PREPARATION OF. De Bruyn, Ltd., 20, Eastcheap, London, E.C.3, and C. Revis, 94, Station Road, Barnes, London, S.W.13. Application date, Feb. 6, 1920.

Decolourising charcoal suitable for use in the refining of oils is prepared from filter-press residues from the refining of edible oils such as cotton-seed oil or pea-nut oil. These residues are carbonised in a reverberatory furnace at a temperature slightly above the flash-point of the oil, so that a dry, porous, carbonaceous residue is left. The air supply is regulated so that lamp black is produced as a combustion product. The product is washed with dilute hydrochloric acid to neutralise any alkali, and then moulded and again heated.

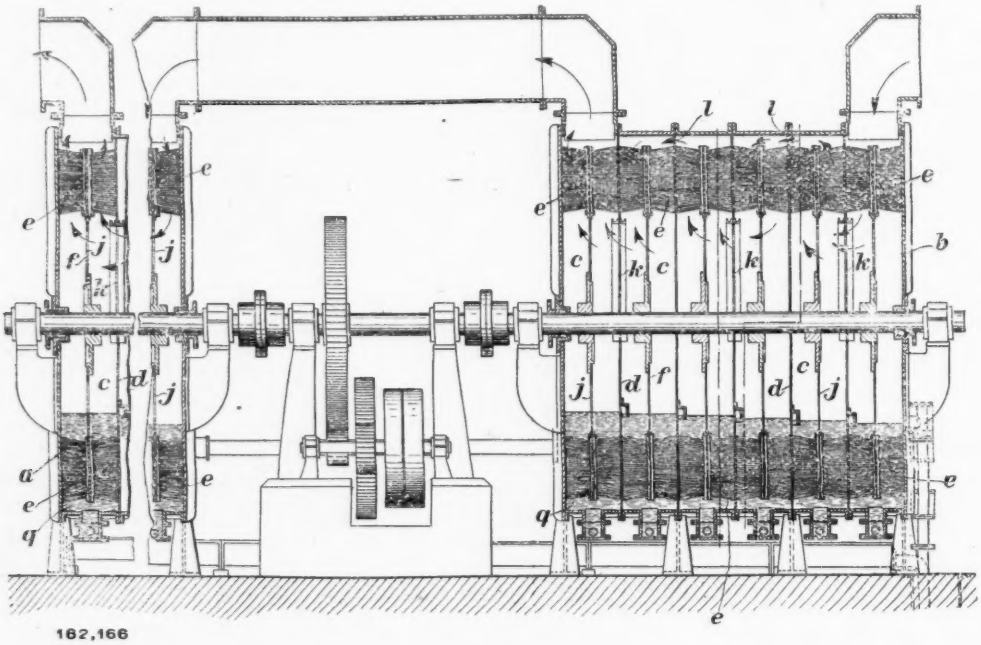
162,136. DISTILLING CARBONACEOUS MATERIAL, APPARATUS FOR. W. P. Perry, 19, Lytton Road, Leytonstone, London, E.11. Application date, February 25, 1920.

The distilling apparatus is of the type in which carbonaceous material is distilled in contact with hot gas, in a distilling

chamber having a number of openings into a gas-distributing chamber on one side and a collecting or condensing chamber on the other side. The hot gas may be produced in or supplied to the distributing chamber, which is of the same or greater capacity to that of the distilling chamber, and the collecting chamber is of equal size. The height of all chambers is preferably the same.

162,166. LIQUIDS AND GASES, APPARATUS FOR BRINGING INTO INTIMATE CONTACT. W. C. Holmes & Co., Ltd., D. M. Henshaw and J. Whittell, Whitestone Iron Works and Turnbridge Foundry, Huddersfield. Application date, April 1, 1920.

The apparatus is of the type in which a number of discs carrying brushes rotate in a casing while dipping into the washing liquid, and the object is to increase the capacity of such apparatus. Casings *a* and *b* are divided into a number of



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chambers *c* by diaphragms *d* which are brushed by the brushes *e* on both sides of the rotating discs *f*. The discs *f* have gas passages *j*, and the diaphragms *d* have passages *k*, *l* alternately at the centre and circumference so that the gas takes a tortuous path as shown by the arrows. The gas is divided into two streams by each disc as shown which move in parallel through the brushes. The washing liquid is indicated at *q*, and the casings *a*, *b* are duplicates.

NOTE.—The following specifications which are now accepted were abstracted in THE CHEMICAL AGE, when they became open to inpsection under the International Convention :—137,284 (W. A. Patrick, B. F. Lovelace, and E. B. Miller), relating to separating and recovering gases, *see* Vol. II, p. 287 ; 139,156 (C. S. Hudson), relating to decolourising carbon, *see* Vol. II, p. 511 ; 141,028 (K. Stiansen), relating to refining oils and fats, *see* Vol. II, p. 643.

International Specifications not yet Accepted

160,747. OXALATES AND OXALIC ACID. Oldbury Electro-Chemical Co., Niagara Falls, N.Y., U.S.A. (Assignees of W. Wallace, La Salle, N.Y., U.S.A.) International Convention date, March 23, 1920.

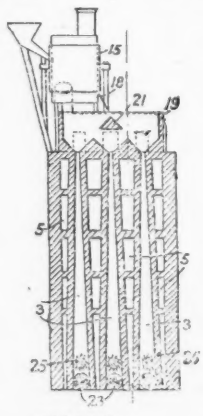
Calcium oxalate is produced by treating a mixture of sodium oxalate, calcium hydroxide, and water, with carbon monoxide under pressure and above 100°C. A solution of sodium formate is also produced and is converted into sodium oxalate by heating to 440°C., for use in the first stage of the process. The calcium oxalate may be treated with sulphuric acid to obtain oxalic acid.

160,759. ALUMINIUM CHLORIDE. Armour Fertiliser Works, Union Stock Yards, Chicago. (Assignees of E. C. Baum, 3,248, North Albany Avenue, Chicago, and D. O. Jones, 826, Eleventh Street, Milwaukee, Wis., U.S.A.). International Convention date, March 24, 1920.

In a continuous process for producing aluminium chloride, regulated quantities of aluminium nitride are charged into the top of a tube furnace which is heated internally by burning gases. The gas is then cut off and chlorine passed through. Aluminium chloride is produced and vaporised, and is then condensed.

160,760. ALUMINIUM, EXTRACTING. C. A. Stevens, 39, Broad Street, New York. (Assignees of C. G. Collins, Woodmere, N.Y., U.S.A.). International Convention date, March 6, 1920.

Aluminium ore is mixed with sodium chloride and a carbonaceous substance, and preheated in a container 15 by waste gas. The material then passes through a shoot 18 to a hopper 19, from which it is distributed to vertical heating chambers 3, which expand downwards and are heated by flues 5. Rotary breakers 25 and conveyors 23 discharge the material at the bottom. The mixture may also contain oxalates formed by including sawdust and alkali with the ore.



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160,765. OXYALDEHYDES. Soc. Chimique des Usines du Rhone, anciennement Gilliard, P. Monnet, et Cartier, 21, Rue Jean Goujon, Paris. International Convention date, March 24, 1920.

A phenol or derivative is condensed with an ester or ether of the hypothetical glycol $CH_2(OH)_2$ in the presence of an aromatic nitroso body, to produce aromatic oxyaldehydes. An example is given of the preparation of vanillin.

160,776-7. SACCHARIFYING WOOD, &C. S. F. Acree, 801, University Avenue, Syracuse, N.Y., U.S.A. International Convention date, March 25, 1920.

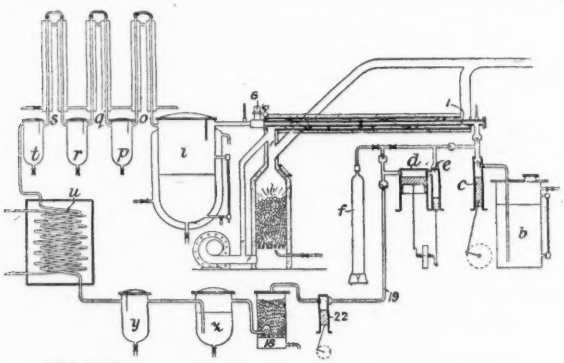
160,776. Vegetable substances such as wood, cotton seed

hulls, corn cobs, &c. are hydrolysed with acids between 70°C. and 100°C. to produce sugars. The wood is first heated to the required temperature and treated with a current of dilute acid. A detailed description of the process for obtaining galactose is given.

160,777. Galactose solution is oxidised electrolytically by the action of oxygen in the presence of ultra violet light, or by other oxidising agents such as nitric acid. Mucic acid is produced.

160,789. HYDROCARBONS. J. A. Vielle, 17, Waterloo Place, Pall Mall, Westminster, and H. Plauson, 14, Huxter, Hamburg, Germany. International Convention date, March 24, 1920.

Coal, peat, tar oil, or the like is heated under pressure with alkali and treated with hydrogen at 700°C. and 15-25 atmospheres pressure, or 400°C. and 150-200 atmospheres, to obtain low-boiling hydrocarbons. The material is forced by a pump *c* from a container *b* to a reaction tube 1, which is heated by



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furnace gases. Hydrogen is supplied from a reservoir *f*, and the resulting products pass through a valve 6 to a cooled expansion vessel *i*. Some of the products condense in this vessel and the remainder in coolers *o*, *q*, *s*, *u* and vessels *p*, *r*, *t*, *y*. The gas passes on to a vessel *z*, where carbon dioxide is absorbed, and then to a tower 18, where hydrogen, methane, &c., are dried for use again in the process.

160,810. FERTILISERS. L'Azote Francais, Soc. Anon., 126, Rue de Provence, Paris. (Assignees of P. A. Guye, Geneva.) International Convention date, March 29, 1920.

Tricalcium phosphate is treated with nitric acid, and the product neutralised with cyanamide. The moist material is then mixed with a powdered solid such as cyanamide, natural phosphate, slag or potassium chloride.

160,811. AMMONIA. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude, 48, Rue St. Lazare, Paris. International Convention date, March 30, 1920.

The mixture of nitrogen and hydrogen is raised to the reaction temperature by circulating it around the inner tube containing the catalyst. The gases then impinge on the catalyst at one end of the tube. An electric heating coil may be provided to regulate the temperature.

160,840. SYNTHETIC FATS. G. Schicht Akt.-Ges, and A. Grün, Aussig-on-Elbe, Germany. International Convention date, April 1, 1920.

Mixtures of the fatty acids from butyric acid upwards are esterified with glycerol to obtain fats resembling natural fats. The formation of trigylcerides of particular acids is avoided by preparing a monogylceride of one acid, converting it to a diglyceride with another acid and to a trigylceride with another acid.

LATEST NOTIFICATIONS.

163,262. Method for the manufacture of manganese alloys poor in carbon or silicon or else manganese. Aktiebolaget Ferrolegeringar. May 12, 1920.

163,263. Method for producing chromium or alloys of chromium. Aktiebolaget Ferrolegeringar. May 12, 1920.

163,267. Process and apparatus for moulding and annealing glass. Clark, W. G. May 11, 1920.

163,271. Process for the production of oily bodies of high boiling point. Lilienfield, D.L. May 10, 1920.

163,272. Neutralising oils and fats. Soc. Rocca, Tassy et De Roux. May 3, 1920.

163,277. Process and apparatus for the conversion of hydrocarbon oils. Emerson, V. L. May 6, 1920.

163,304. Process for manufacturing anhydrous chlorides of alkaline-earth metals. Minami Mansu Tetsudo Kabushiki Kaisha. May 15, 1920.

163,316. Meter for inflammable liquids. Compagnie Pour La Fabrication Des Compteurs et Materials D'Usines à Gaz. May 14, 1920.

Specifications Accepted with date of Application

136,837. Gaseous mixtures liquefiable at very different temperatures, Separation of the constituents of. Soc. l'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude. February 4, 1914.

138,116. Cellulose compounds, Manufacture of. Deutsche Celluloid Fabrik. January 9, 1918.

138,622. Tin from stanniferous waste products, Method of recovering. T. A. Eklund. February 1, 1919.

139,220. Ore, stone and like crushers. J. E. Kennedy. March 6, 1914.

140,051. Phthalic anhydride, Manufacture of. H. Sasa. March 7, 1919.

145,781. Ammonium sulphate from saturator baths, Method of discharging. F. J. Collin Akt.-Ges zur Verwertung von Brennstoffen und Metallen. April 2, 1919.

146,218. Iron salt, Process for the production of a solid non-hygroscopic. O. Rohm. April 11, 1919. Addition to 146,214.

148,998. Gas-analysing apparatus. M. Arndt. November 30, 1915.

162,678. Evaporising or condensing solutions, emulsions and suspensions, method of and apparatus for—and the production of chemical reactions. G. A. Krause. November 23, 1917.

162,682. Metals from solutions, Process for the extraction of—or for the separation of metals. W. J. Browning. July 31, 1919.

162,684. Coal and similar carbonaceous substances, Distillation of. Low Temperature Carbonisation Ltd. T. M. Davidson and H. L. Armstrong. August 21, 1919.

162,687. Colouring matters, Production of. Sir W. J. Pope and Scottish Dyes, Ltd. September 27, 1919.

162,718. Iron ore containing weakly magnetic or non-magnetic oxygen compounds of iron, Process and apparatus for treating poor. R. Storen and R. Johanson. December 29, 1919.

162,727. Pitch, Treating. F. J. Commin. January 2, 1920.

162,769. Sawdust and other finely divided material, Apparatus for carbonising—and for treating gases and vapours with finely-divided substances. P. Poore. February 2, 1920.

162,873. Crude oil refining processes and apparatus. J. G. P. Evans. March 9, 1920.

Applications for Patents

Anderson D. G. Preparation of synthetic resins. 13,744. May 17.

Badische Anilin & Soda Fabrik & Johnson, J. Y. Production of pigment colours. 14,161. May 20.

Barritt, N. W. Azo dye-stuffs and interme diates. 13,764. May 17.

Bergh, S. V. & Larsson, R. E. Retorts for distilling shale &c. 14,153. May 20.

Chemische Fabrik vorm. Sandoz. Process for manufacture of a new preparation of hexamethylenetetramine. 13,981. May 18. (Switzerland, June 12, 1920).

Harter, H. Process for production of a contact mass for the catalytic synthesis of ammonia. 13,656. May 13.

Maclaurin, R. Preparation of synthetic resins. 13,744. May 17.

Marino, Q. Process for removing rust, paint, grease, &c., from iron or steel. 14,164. May 20.

Nitrogen Corporation. Preparation of hydrogen and ammonia. 13,812. May 17. (United States, May 14, 1920).

,, Production of hydrogen from hydrocarbons. 13,813. May 17. (United States, May 25, 1920).

Plauson, H. Extraction of wood. 13,758. May 17.

,, Process for saccharification of wood and other cellulosic materials. 14,187. May 21.

,, Manufacture of ichthyol oil and ichthyol preparations, &c. 14,188. May 21.

,, Refining china clay, &c. 14,189. May 21.

Plauson's (Parent Co.), Ltd. (Plauson). Extraction of wood. 13,758. May 17.

,, Process for saccharification of wood and like cellulosic materials. 14,187. May 21.

,, Manufacture of ichthyol oil and ichthyol preparations, &c. 14,188. May 21.

,, Refining china clay, &c. 14,189. May 21.

Soc. Anon. de Produits Chimiques Etablissements Malétra. Continuous production of sulphates. 14,035. May 19. (France, May 25, 1920).

,, Process for production of acetaldehyde from acetylene. 14,049. May 19. (France, June 15, 1920).

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

The stagnation in the chemical market during the last week has continued and little improvement is likely until the industrial situation improves. There is evidence in all directions, however, that stocks of many commodities are practically exhausted and a temporary shortage of supplies is likely to be experienced as trade revives.

A certain export activity continues, but the volume of business is most unsatisfactory.

General Chemicals

ACETONE stocks are practically cleared and the firmer tendency is fully maintained.

ACID ACETIC is fully maintained.

ACID ACETIC again exhibits a stronger undertone, but the inquiry is limited.

ACID CITRIC maintains its firmer position.

ACID FORMIC is nominally unchanged with little demand.

ACID LACTIC is again in better demand, and prices seem likely to go higher.

ACID OXALIC is very quiet, but the price is firmly maintained.

ACID TARTARIC.—The demand continues to be very disappointing, but the price appears to have reached bottom.

BARIUM CHLORIDE is unchanged.

BLEACHING POWDER.—The situation continues in buyers' favour, and stocks are difficult to realise.

COPPER SULPHATE.—The better tendency is maintained, although there is still room for considerable improvement.

FORMALDEHYDE is rather lower in price, and business is of the hand-to-mouth variety.

LEAD ACETATE.—The demand has slackened again, but no change in price is indicated.

LEAD NITRATE maintains its firmer tone, but the volume of business reported is not extensive.

POTASH BICHROMATE remains a secondhand market, distinctly in buyers' favour.

POTASH CARBONATE.—There is nothing doing.

POTASH CAUSTIC.—Sales are reported of a drum here and a drum there, but the demand remains nominal. The price remains unchanged.

POTASH PERMANGANATE is inclined to be firmer, but the demand is small.

POTASH PRUSSIATE has eased off slightly, but the small stocks are in firm hands.

SODIUM ACETATE.—No business is reported.

SODIUM BICHROMATE remains a weak market with little doing.

SODIUM CAUSTIC is still pressed for sale by secondhands, and the position is very unsatisfactory.

SODIUM HYPOSULPHITE is in moderate demand, and the price is inclined to be rather firmer.

SODIUM NITRITE is not much inquired for. The price is nominally unchanged.

SODIUM PHOSPHATE.—The slight improvement in demand, which we indicated last week, has been maintained, but the price is still in buyers' favour.

SODIUM PRUSSIATE.—No further advance in price is indicated, but the position remains firm.

SODIUM SULPHIDE is lifeless and business could be done below the nominal price.

Coal Tar Intermediates

Trade continues extremely quiet in intermediate products. Most of the producers and many of the consumers are now entirely shut down on account of the strike, so that there are practically no changes to report.

ALPHA NAPHTHYLAMINE is very quiet, but the price continues steady.

ANILINE OIL and SALT.—Business is extremely light and there is practically no demand on export account.

BETA NAPHTHOL is stagnant with orders few and far between.

BENZIDINE BASE is quietly steady.

DIMETHYLANILINE is in small supply but there are very few orders.

DIPHENYLAMINE remains quietly steady.

H. ACID is in small request.

NITROBENZOL continues fairly steady but business is of small dimensions.

NAPHTHIONIC ACID is quiet and uninteresting.

PARANITRANILINE is quiet and easy.

SALICYLIC ACID continues firm with an upward tendency.

Coal Tar Products

Owing to the shortage of many products, the prices mentioned hereunder are mainly more or less nominal.

BENZOL 90 PER CENT. is selling at 2s. 10d. per gallon on rails in the North, and 3s. on rails in the South.

PURE BENZOL is quoted at 3s. on rails in the North and 3s. 2d. on rails in the South.

CREOSOTE OIL is difficult to obtain for prompt delivery, and is worth 8½d. to 9d. per gallon in the North and 9½d. to 10d. in the South.

CRESYLIC ACID still remains inactive, pale quality 97/99 per cent. being worth from 2s. 1d. to 2s. 3d., while 95/97 per cent. is worth 1s. 11d. to 2s.

SOLVENT NAPHTHA is scarce and is quoted at 2s. 6d. per gallon.

HEAVY NAPHTHA is difficult to obtain and is worth 2s. 3d. to 2s. 4d. per gallon.

NAPHTHALENE is inactive, crude qualities being worth from £8 to £12, while refined are in the region of £18 to £23.

PITCH.—The market is quiet, and prices are unchanged.

Sulphate of Ammonia

There are no new features to report.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	3	to	0	2	6
Acetone oil	ton	95	0	0	to	100	0	0
Acetone, pure	ton	105	0	0	to	110	0	0
Acid, Acetic, glacial, 99-100%	ton	70	0	0	to	72	0	0
Acetic, 80% pure	ton	53	0	0	to	54	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst	ton	69	0	0	to	70	0	0
Carbolic, cryst. 39-40%	lb.	0	0	6	to	0	0	6½
Citric	lb.	0	2	7	to	0	2	9
Formic, 80%	ton	77	0	0	to	80	0	0
Gallic, pure	lb.	0	4	0	to	0	4	3
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	37	10	0	to	40	0	0
Lactic, 60 vol.	ton	42	10	0	to	45	0	0
Nitric, 80 Tw.	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	0	10	to	0	0	11
Phosphoric, 1.5	ton	55	0	0	to	57	0	0
Pyrogallic, cryst	lb.	0	8	0	to	0	8	3
Salicylic, Technical	lb.	0	1	0	to	0	1	2
Salicylic, B.P.	lb.	0	1	5	to	0	1	7
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	1	9	to	0	1	10
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	45	0	0	to	50	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	15	0	0	to	16	0	0
Aluminium, sulphate, 17-18%	ton	18	0	0	to	19	0	0
Ammonia, anhydrous.	lb.	0	2	2	to	0	2	4
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	4	to		—	
Ammonia, chloride	ton	65	0	0	to	70	0	0
Ammonia, muriate (galvanisers)	ton	50	0	0	to	52	0	0

	per	£	s.	d.		£	s.	d.
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	95	0	0	to	100	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	0
Amyl acetate	ton	420	0	0	to	425	0	3
Arsenic, white, powdered	ton	52	0	0	to	55	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	20	0	0	to	21	0	0
Nitrate	ton	50	0	0	to	52	0	0
Barium Sulphate, blanc fixe, dry	ton	30	0	0	to	31	0	0
Sulphate, blanc fixe, pulp	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0
Bleaching powder, 35-37%	ton	20	0	0	to	21	0	0
Borax crystals	ton	34	0	0	to	36	0	0
Calcium acetate, Brown	ton	12	0	0	to	13	0	0
,, Grey	ton	19	0	0	to	21	0	0
Calcium Carbide	ton	29	0	0	to	30	0	0
Chloride	ton	12	10	0	to	13	0	0
Carbon bisulphide	ton	65	0	0	to	67	0	0
Casein, technical	ton	90	0	0	to	92	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	11	6	to	0	12	6
Oxide, black	lb.	0	16	0	to		—	
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	35	0	0	to	37	0	0
Cream Tartar, 98-100%	ton	130	0	0	to	135	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	103	0	0	to	105	0	0
Formusol (Rongalite)	lb.	0	4	9	to	0	5	1
Glauber salts, commercial	ton	6	0	0	to	7	0	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	45	0	0	to	50	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	50	0	0	to	52	0	0
Carbonate (White Lead)	ton	43	0	0	to	46	0	0
Nitrate	ton	55	0	0	to	57	0	0
Litharge	ton	38	10	0	to	40	0	0
Lithopone, 30%	ton	30	0	0	to	32	10	0
Magnesium chloride	ton	18	0	0	to	19	0	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	10	10	0	to	11	10	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0

	per	£	s.	d.		£	s.	d.
Manganese, Borate	ton	70	0	0	to	75	0	0
Sulphate	ton	75	0	0	to	78	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	ton	145	0	0	to	150	0	0
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potash, Caustic	ton	45	0	0	to	48	0	0
Potassium bichromate	lb.	0	0	9½	to		—	
Carbonate, 90%	ton	50	0	0	to	55	0	0
Chloride	ton	38	0	0	to	40	0	0
Chlorate	lb.	0	0	8½	to	0	0	9
Meta bisulphite, 50-52%	ton	130	0	0	to	140	0	0
Nitrate, refined	ton	50	0	0	to	52	0	0
Permanganate	lb.	0	2	0	to	0	2	3
Prussiate, red	lb.	0	2	6	to	0	2	9
Prussiate, yellow	lb.	0	1	6	to	0	1	7
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt	3	15	0	to		—	
Seconds	cwt	3	10	0	to		—	
Sodium acetate	ton	35	0	0	to	37	10	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	7½	to	0	0	8
Bisulphite, 60-62%	ton	35	0	0	to	37	10	0
Chlorate	lb.	0	0	5½	to	0	0	5½
Caustic, 70%	ton	24	0	0	to	24	10	0
Caustic, 76%	ton	25	0	0	to	25	10	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	22	0	0	to	24	0	0
Nitrite, 96-98%	ton	48	0	0	to	50	0	0
Phosphate, crystal	ton	25	0	0	to	27	0	0
Perborate	lb.	0	1	9	to	0	2	0
Prussiate	lb.	0	0	8	to	0	0	8½
Sodium Sulphide, crystals	ton	19	0	0	to	20	0	0
Sulphide, solid, 60-62%	ton	26	0	0	to	30	0	0
Sulphite, cryst	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Strontium Nitrate	ton	84	0	0	to	90	0	0
Strontium Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	2	3	to	0	2	6
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7

Company News

CASSEL CYANIDE.—An interim dividend of 4d. per share, less tax, is announced.

DOMINION GLASS.—The directors announce a dividend of 1½ per cent. on the common stock, payable on July 1.

BRITISH OIL & CAKE MILLS.—It is officially announced that a rumour to the effect that a new issue of shares is contemplated is entirely without foundation.

WILLIAM GOSSAGE & SONS.—The transfer books for the 5 per cent. first cumulative preference shares will be closed from May 17 to 31 for preparing and issuing dividend warrants.

W. H. DORMAN & CO.—A rumour has been current during the week that the company's recent issue of £350,000 of 8 per cent. first mortgage debenture stock at 94 has been withdrawn.

NITRATE RAILWAYS CO.—Share certificates to bearer, Coupon No. 42, are payable after May 24 at the Anglo-South American Bank, Ltd., Old Broad Street, E.C., or at the Bank of Messrs. de Neuflize & Co., Paris; or at the Banque Industrielle Belge, Brussels.

LAUTARO NITRATE CO.—The balance from 1919 was £66,587, and, after depreciation, maintenance of plant, &c., the net profit for 1920 is £5,334, making £71,922, which sum, under the existing circumstances, the directors propose to carry forward. Meeting, Winchester House, June 2, 11 o'clock.

NATIONAL DRUG & CHEMICAL CO.—The accounts of the National Drug & Chemical Co., of Montreal, for the year to Jan. 31 last, state that after paying all trade expenses, providing for bad debts, as well as paying preference dividends, a balance of $104,834 is carried forward. The profit and loss account showed a trading profit for the year, after providing for war taxation, of $267,437.

UNITED LIMMER & VERWOHLE ROCK ASHPHALTE.—The report for 1920 shows a profit, after writing off depreciation in Germany and in Sicily, and providing £350 in respect of Corporation profits tax, of £6,959. The directors propose to place £4,000 to reserve and to pay a dividend of 2½ per cent. for the year, leaving to be carried forward £709. The last dividend was an interim dividend of 4 per cent., paid in July, 1914.

NITRATE PRODUCERS' STEAMSHIP.—The profit for the year to April 30 last amounted to £322,270, and £9,973 was brought in, making £332,243. It is proposed to pay a further dividend at the rate of 10 per cent. per annum for the final six months of the financial year, with a bonus of 5 per cent., free of tax, making 15 per cent. for the year, and to place the whole of the balance, £237,799, to a special emergency reserve. The meeting was held at 20, Billiter-buildings, E.C., on Friday morning.

LEVER BROTHERS, LTD.—A Stock Exchange announcement authorises dealings in 1,815 7 per cent. preference shares of £1 each, fully paid, Nos. 23,555,719 to 23,557,533; and 448 8 per cent. "A" preference shares of £1 each, fully paid, Nos. 15,466,703 to 15,467,150. These securities will rank *pari passu* with those in which special settling days have already been appointed, as soon as they are identical and the certificates are ready for distribution, and with those for which an official quotation has already been granted as soon as they are identical and are officially quoted.

BRUNNER, MOND & CO.—Balance dividend at the rate of 6 per cent. per annum, less tax, making 8 per cent., less tax, for the year to March 31, 1921, is announced, as against 11¼ per cent., less tax, for the previous year. Profits have been charged with £50,000 placed to suspense account, £165,000 to depreciation, and £264,000 written off stocks, the carry forward being £141,000. Last year £50,000 was placed to suspense, £150,000 to depreciation, and £126,000 carried forward.

JURGENS, LTD.—The net profit of Jurgens, Ltd., for 1920 was £377,468 (against £222,040 in 1919), while £68,813 was brought forward. The directors have applied £254,207 to write down to market value the stocks of raw materials, by-products, and margarine at December 31 last, and now propose to pay the final dividend on the preference shares making the full 7 per cent. for the year, leaving to carry forward £17,074. In 1919 a dividend of 7 per cent. was paid on the ordinary shares.

CHALK FUEL, POWER, GAS, AND BY-PRODUCTS CORPORATION, LTD.—This Company, which has a share capital of £16,000, divided into 60,000 ten per cent. participating preference shares of 5s. each, and 20,000 Founders' shares of 1s. each, has been making an issue of 29,947 ten per cent. participating preference shares of 8s. per share, 17,303 Founders' shares of 5s. per share, and 50,000 nine per cent. (income-tax free) short term bonds of £1 each at par. The corporation was formed in 1914 to exploit and work certain inventions and a secret process for the production of cheap fuel. The company's operations have been held in abeyance owing to the war.

ALIANZA CO., LTD.—The net profit for 1920 amounted to £779,665, and £286,737 was brought in, making a total of £1,066,402. A further dividend of 45 per cent., making 75 per cent. for the year is announced, leaving to be carried forward £691,402. Profit has been taken in the accounts on 2,919,161 quintals, which includes the stock at December 31, 1920, all of which was sold at that date. Both oficinas, Alianza and Bellavista, worked throughout the year, producing 1,480,236.42 quintals and 1,372,924.76 quintals respectively. Meeting, 77 Calle Prat, Valparaiso, June 7, at 3 p.m.

SALAR DEL CARMEN NITRATE SYNDICATE.—The directors announce a final dividend (subject to audit) of 15 per cent., less tax, in respect of the year ended December 31, making 20 per cent. for the year; £10,000 is transferred to reserve; £5,000 is applied to depreciation, and £8,615 is carried forward. In 1919 the total dividend was 5 per cent. and £8,479 was carried forward.

BROKEN HILL PROPRIETARY, BLOCK 14.—A cabled advice from the head office in Melbourne states that the half-yearly meeting will be held in Melbourne on May 30. Operations for the half-year to March 31 last have resulted in a net loss, after providing for depreciation, of £17,672. Credit balance to profit and loss account carried forward, £29,443. The assets show a surplus of £26,025; this does not include shares in other companies. Copies of the reports and accounts should be in the hands of shareholders on the London register about the end of next month.

NOBEL INDUSTRIES, LTD.—It is announced that the directors have now received from the constituent companies sufficient particulars of the trading results of 1920 to indicate that the profits for the year will not be less than those of the preceding year. They are of the opinion that, despite the satisfactory character of these results, in view of the serious position in the coal mining industry, upon which many of their factories are so dependent, and of the impossibility of judging how long present conditions may last, it is necessary to conserve their resources in every way, and not to make such distribution of profit as would in normal circumstances be justified. They therefore do not propose to recommend the payment of any dividend on the ordinary shares, but to carry forward the whole available balance of profit to the year 1921. The preference dividend due on August 1 next will be paid in the ordinary course. In 1919 the ordinary shares received 10 per cent., and the deferred shares 5 per cent.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
Toronto ...	Dyes	641
Montreal ...	Dry colours, including chalk; whiting; lithophone; ultramarine; blue; zinc oxide; china clay	646
Smyrna (Asia Minor)	Chemicals; petrol and carbide ...	660
Buenos Aires	Heavy chemicals; fine chemicals	664

The directors of the Anglo-Chilian Nitrate & Railway Co. announce that they have completed negotiations for the sale of the company's NITRATE GROUNDS known as San Andres, Parvenii Puntillas, and Flor de Licancour,, for £200,000.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Companies Winding Up Voluntarily.

JOHN BELL & CROYDON, LTD. (in voluntary liquidation) —Creditors' claims on or before June 10, 1921, to the Liquidator, Stewart Cole, of Sardinia House, Sardinia Street, Kingsway, London, W.C. NOTE.—The liquidation is for the purposes of reconstruction, and all debts will be paid in full.

BRITISH GUIANA BAUXITE, LTD.—A meeting of creditors will be held at 5-6, Great Winchester Street, London, E.C.2, on June 3, 1921, at 2 p.m. W. J. Andrews, Liquidator.

Partnerships Dissolved

JONES, T. H., ROBERTS E. O., ROBERTS, T. S., ROBERTS, R. O., and JONES, R., carrying on business as basic slag grinders, 10, Dale Street, Liverpool, under the style of THE WESTERN COUNTIES BASIC SLAG CO., has been dissolved by mutual consent as and from April 8, 1921. All debts will be received and paid by T. Humphreys, E. O. Roberts, T. S. Roberts and R. O. Roberts, who will in future carry on the business under the same name.

WEBSTER, W. E., 4, Bark Street, Hulme, Manchester, and BARROW, J., 285, Frederick Street, Oldham, carrying on business as drysalters, at Welton Place, Moor Street, Rusholme, Manchester, under the style of Webster & Barrow, and theretofore Beaumont & Co., by mutual consent as on and from May 19, 1921. All debts will be received and paid by John Barrow, who will in future carry on the business.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of* 1908, *provides that every Mortgage or Charge, as described therein, created after July* 1, 1908, *shall be registered within* 21 *days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July* 1, 1908, *require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

BRITISH TAR PRODUCTS, LTD., London, S.W.—Registered May 11, £50,000 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act, 1908), present issue £45,030; general charge.

DUNLOP RUBBER CO., LTD., London, N.W.—Registered May 7, Trust Deed dated April 29, 1921, securing £6,000,000 1st debenture stock; charged on land, buildings, &c., with fixed plant, machinery, &c., as specified in Trust Deed, also general charge. *Nil. March 11, 1920.

WEST OF ENGLAND PORTLAND CEMENT & LIME CO., LTD., Bridgwater.—Registered May 9, £2,700 debentures; general charge (excluding about 34 acres land at Charlton Mackrell). *Nil. April 13, 1921.

Satisfaction

HYDRAULIC ENGINEERING CO., LTD., Chester.—Satisfaction registered May 12, £16,100, part of amount registered January 20, 1916.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

HAYES, P. W., 7, Hartland Street, Fulwood, chemist, £12 1s. April 12.

BLANKLEY, F. B., 115, High Street, Brierley Hill, chemist, £18 12s. 6d. April 7.

SMITH, W. H., 74A, Linthorpe Road, Middlesbrough, wholesale drysalter, £29 9s. 6d. April 18.

BEVAN, M. L., Morriston, chemist, £13 10s. 8d. April 11.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 *and* 117, *Chancery Lane, London, W.C.*2 :—

DONALD LOCKWOOD & CO., LTD., 21, Sugar House Lane, Stratford, E. Wholesale and retail manufacturing chemists. Nominal capital £1,500 in 30,000 shares of 1s. each. Directors: D. R. Lockwood and B. Sherman.

COLOMBIAN CARIBBEAN SYNDICATE, LTD. To acquire lands or any interest in any lands, mines, minerals, ores, coal, natural gas, oil shale, petroleum or other substances and carry on the business of producers of petroleum and other mineral oils, &c. Nominal capital £10,000 in 10,000 shares of £1 each. Directors: To be appointed by Subs. Subs.: A. E. Hunter and A. E. Guddon.

HILL & CO. (CHEMISTS), LTD., 1, Academy Street, Warrington. Chemists and druggists. Nominal capital £5,000 in 5,000 ordinary shares of £1 each. Directors: J. S. Hill, E. Hill and R. W. Taylor.

MAPLE LEAF SODA FOUNTAIN CO., LTD. (incorporated in Canada), 49, Westbourne Grove, London, W. 2. To manufacture, buy, sell and deal in bottles, syphons, stoppers, pharmaceutical and chemical appliances, &c. Nominal capital 500,000 dollars in 100,000 shares of 5 dollars each. Person authorised to accept service: William Mackintosh Macleod.

ANSAY (R.), LTD., 44, Wilson Street, E.C. 2. Merchants and brokers, manufacturers and dealers in all kinds of chemicals, drugs and oils. Nominal capital: £2,500 in 2,470 preference shares and 30 ordinary shares of £1 each. Directors: To be appointed by Subs. Qualification of Directors: 1 share.

CLARK (W. H. S.) & CO., LTD., 56, High Street, Lewes, Sussex. Manufacturers and dealers in manures and fertilisers of all kinds and dealers and merchants of farm and other produce. Nominal capital: £6,000 in 120 shares of £50 each. Min. Subs.: 20 shares. Directors: W. H. S. Clark, H. J. Chapman, W. A. Cowley, F. Martin, A. Leggat, G. Hemsley. Qualification of directors: 2 shares. Remuneration of directors: £25 each.

DEVON CHEMICAL COMPANY, LTD., Harlington, Newton Abbot, Devon. Chemists and druggists. Nominal capital: £500 in 500 shares of £1 each. Directors: G. F. Storey, N. V. Stow, A. W. Simpson, J. H. Keighley, H. S. Prince. Qualification of directors: 1 share.

GILES & TATTERSALL, LTD. Carry on the business of chemists and druggists, &c. Nominal capital: £1,200 in 1,200 shares of £1 each. Directors: To be appointed by subscribers. Qualification of directors: 1 share. Subs.: E. S. Giles and L. Tattersall.

INTERNATIONAL GLUE SYNDICATE, LTD., 43, Great Tower Street, E.C. Registered 13th May, 1921. Manufacturers and dealers in glue, gelatine, &c. Nominal capital: £3,000 in 3,000 ordinary shares of £1 each. Directors: To be appointed by subscribers. Qualification of directors: 1 share.

MABYN & COMPANY, LTD. Manufacturing, wholesale and retail chemists and druggists. Nominal capital: £500 in 500 shares of £1 each. Directors: H. W. W. Northwood (governing director and chairman). Qualification of directors: 1 share.

SLAG PHOSPHATE CO., LTD. Manufacturers of slag phosphates. Nominal capital: £250,000 in 250,000 shares of £1 each. Directors: Sir J. R. Wright, Sir W. C. Wright, K.B.E., F. W. Gilbertson, J. C. Davies, C.B.E., and G. V. Parker. Qualification of directors: 5,000 shares.

ZETA DRUG CO., LTD., 180, Fleet Street, E.C. 4. Chemists and druggists. Nominal capital: £500 in 500 ordinary shares of £1 each. Directors: T. C. King and S. Westall. Qualification of directors: £100.